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THE INFLUENCE OF PERSONAL CHARACTERISTICS, PERCEIVED INNOVATION CHARACTERISTICS, ATTITUDE, AND SUBJECTIVE NORM UPON INTENT TO ADOPT INTERNET PHARMACY SERVICE: AN ADOPTION OF INNOVATIONS STUDY

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by

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Dissertation

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

In Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas at Austin

August 2002

DEDICATION

This work is dedicated to my family and close friends.

ACKNOWLEDGEMENTS

The Latin root for the word educate is *duc re* which means to lead out. Not only does the word imply a journey or path to (what hopefully leads to) enlightenment, but also, it describes the nature of the journey itself. It is one that, by definition, requires assistance, guidance, and the aid of others. As with all educational endeavors, this one would not have been possible without the help of many. First, I would like to acknowledge my entire dissertation committee. I would like to especially thank Vijay Mahajan, who was instrumental in the formative stages of the concept proposal. Also, I extend my most sincere gratitude to Carolyn Brown and James Wilson, whose oversight and counsel have been invaluable.

I would also like to thank my family for their continued love and emotional support. Finally, I would like to acknowledge the support of my friends and **all** of my colleagues in the Division of Pharmacy Administration, especially Sumeet, Mike, Grant, Woodie, Deirdre, Lonnie, Jay, Jennie, Marcus, Scott, Robert, Mo, and Geoff. They were quick to respond with aid or advice or understanding. During times of great need, the dread moments when hope was dwindling, they answered with just the right amount of support and concern. Thank you.

THE INFLUENCE OF PERSONAL CHARACTERISTICS, PERCEIVED INNOVATION CHARACTERISTICS, ATTITUDE, AND SUBJECTIVE NORM UPON INTENT TO ADOPT INTERNET PHARMACY SERVICE: AN ADOPTION OF INNOVATIONS STUDY

Publication No._____

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The University of Texas at Austin, 2002

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The purpose of this dissertation was to use a theoretical model to examine the intent to adopt Internet pharmacy service. Using a theory of reasoned action model adapted from two models in the fields of innovation-characteristics research and technology acceptance, this study analyzed the relationships between intent to adopt Internet pharmacy service and attitude toward Internet pharmacy use, subjective norm toward Internet pharmacy use, selected user perceptions (perceived relative advantage, perceived simplicity, perceived compatibility, and perceived risk) and selected user characteristics (total family income and formal education level).

A web-enabled self reported survey data collection instrument was used to collect data from faculty and staff members of The University of Texas at Austin. A structural equation modeling program was used to analyze the relationships between model variables. Of the 15 original model hypotheses, 10 were confirmed. Attitude

towards Internet pharmacy service use and subjective norm towards Internet pharmacy use were found to exert a direct positive influence upon intent to use Internet pharmacy. Perceived relative advantage, perceived simplicity and perceived compatibility were found to exert a direct positive influence while perceived risk and formal education were found to exert a direct negative influence upon attitude towards Internet pharmacy use. Perceived simplicity, and perceived compatibility were found to exert a direct negative effect upon perceived risk of Internet pharmacy use, and perceived compatibility was found to exert a direct positive effect upon perceived relative advantage.

In general, the intent to adopt Internet pharmacy service is driven primarily by attitude toward Internet pharmacy service (total effect = 0.566), and perceived compatibility of Internet pharmacy service (total effect = 0.312). The practical and theoretical implications of these findings are discussed. In summary, this study helps to identify perceptions and factors that explain the intent to adopt Internet pharmacy service. These factors may be important to health systems and policy makers that wish to encourage widespread adoption of web-enabled health technologies.

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CHAPTER 1: INTRODUCTION

1.1 Background

> The Internet has revolutionized the computer and communications world like nothing before. The invention of the telegraph, telephone, radio, and computer set the stage for this unprecedented integration of capabilities. The Internet is at once a world-wide broadcasting capability, a mechanism for information dissemination, and a medium for collaboration and interaction between individuals and their computers without regard for geographic location.[1]

What has become today's Internet began as a research project initiated in 1969 by the Department of Defense and the Advanced Research Project Agency.[2] This first node of the ARPANET, as it was referred to then, was located at the University of California at Los Angeles, and connected the Stanford Research Institute, The University of California at Santa Barbara, and The University of Utah. Its development was commissioned by the Department of Defense to provide a reliable means by which information could be rapidly transmitted across the country in the event of nuclear war.[3] Since its embryonic beginnings, the Internet has grown in ways unimaginable by its originators. It has forever changed the way in which we communicate, entertain and conduct business.

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[1] Leiner BM, et al. A Brief History of the Internet. 2000. Web Page. URL: http://info.isoc/org/internet-history/brief.html. 18 September 2000.

[2] Kalakota R, Whinston AB. *Frontiers of Electronic Commerce*. Reading: Addison-Wesley Publishing Company, Inc, 1996.

[3] Gutterman AS, Brown R, Stanislav J. *The Professional's Guide to Doing Business on the Internet*. San Diego: Harcourt Brace & Co, 2000.

Today the Internet, short for *inter*connected *net*works, has been transformed into a powerful business tool. It offers businesses an exciting and innovative medium for reaching customers and enriching customer relationships. An entire economy has sprung up around the Internet. In his book, Opening Digital Markets, Mougavar warned corporate decision-makers of the importance of the growing digital economy:

> The size of traditional markets [will continue] to get smaller and smaller, and if you are not planning to generate a larger part of your revenue from electronic markets, you will be left with only a much smaller market to compete in!… Digital markets are emerging as the next battleground for market share and market dominance.[4]

Internet use in the Unites States has grown at a phenomenal rate. Though there are signs that its growth is beginning to slow, with year-on-year growth decreasing to 14.7% in June of 2001 from 49% in January 2001, the growth in Internet use remains in the double digits.[5] The most recent figures released by the U.S. Department of Commerce indicate that 54% of the US population has web access.[6] Another study reported that as much as 27 percent of U.S. population shops online.[7] Despite the recent nationwide economic slowdown, there is evidence that business to consumer Internet commerce is continuing to grow at a double-digit rate. Internet sales data

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[4] Mougavar W. *Opening digital markets: battle plans and business strategies for Internet commerce.* New York: McGraw-Hill, 1998:18.

[5] Green H. Where did all the surfers go? *BusinessWeek*. 2000; August 6: 35.

[6] United States. U.S. Department of Commerce. A nation online: How Americans are expanding their use of the Internet. Washington: GPO, 2002.

[7] Anon. Global E-Commerce Report July 2000. Web Page. URL: http://worldwide.tnsofres.com/ger/. 31 July 2000.

from the first quarter of 2002 indicate a year-over-year growth of 41 percent over figures from the first quarter of 2001.[8] As Internet use continues to grow, more consumers will look to purchase products and services online.

1.2 Impact on the Healthcare System

The Internet has radically changed the way organizations conduct business, providing an entirely new medium in which to interact with suppliers, partners, clients, and—in the field of healthcare—patients. One of the most profound ways in which the Internet has made an impact on the healthcare system is through its ability to limit barriers to the dissemination of health information. The access to information and interactivity provided by this medium has produced a shift in the balance of power in the patient-health care provider relationship.

Traditionally, there has been an immense knowledge gap that has separated patients and their health care providers. Due to the ease at which the Internet provides ready access to health care information, this knowledge gap is narrowing. A study conducted by Louis Harris and Associates reported that 60 million Americans went online in search of health information in 1998.[9] The National Library of Medicine, which opened up its database to the public in 1997, reports that the number

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[8] Cox B. E-commerce goes on a roll. 2002 Web page: URL: http:// www.internetnews.com/ec-news/article.php/4_1016561. 30 May 2002.

[9] Anon. Sixty Million Seek Health Info Online in the US. Web Page. URL: http://www.nua.ie/surveys/index.cgi?f=VS&art_id=905354697. 5 July 2000.

of searches of its MEDLINE database has increased from seven million in 1994 to 120 million in 1998, with one-third of all searches conducted by consumers.[9] In an online survey of more than 1,000 consumers, 76 percent of all respondents reported using the web to search for health information.[10] There is evidence to suggest that these consumers are using this information to take a more active role in guiding their own care. In an ongoing Internet opinion poll of physicians being conducted by P/S/L Consulting Group, 21% of physicians polled reported that patients come to their office visits with health information they have found on the Internet.[11] In a similar study conducted by P/S/L Consulting Group, 58% of physicians polled reported that they occasionally or often refer their patients to a health-related website.[12] A study conducted by the Pew Foundation found that 41% of all Americans that use the Internet to access health information report that this information influenced how health care treatment was sought or provided.[13] This change in the balance of power between patient and health care provider is producing a shift in the nature of the patient/provider relationship. Bensing et al. describe this as

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[10] Anon. Consumers and Medication Information Research Report 2000. Web Page. URL: http://www.ashp.org/public/public_relations/research_report.html. 21 July 2000.

[11] Anon. Quick Survey Results. P/S/L Consulting Group Inc. Web Page. URL: http://www.docguide.com/QSResults.nsf/SurveyWeb/Frequency. 30 May 2000.

[12] Anon. Quick Survey Results. P/S/L Consulting Group Inc. Web Page. URL: http://www.docguide.com/QSResults.nsf/SurveyWeb/HealthPercentage. 9 July 2000.

a change from the traditional model, in which the doctor was the authoritative decision maker, to one of shared decision-making and cooperation by physicians and patients working together.[14]

In addition to supporting a realignment in the balance of power between patient and healthcare provider, the Internet has also served as a catalyst for the development and implementation of innovative methods for the provision of healthcare. This new medium is being used to help bring patients and health care providers together and facilitate interactions between them. Examples of this include websites such as Diabeteswell.com, Ecureme.com or videoshrink.com, which brings patients and healthcare providers together to facilitate the provision of health care services using a web interface. In addition to sites that bring patients into direct contact with healthcare providers, sites like easydiagnosis.com can provide a user with a diagnosis after filling out an online questionnaire describing signs and symptoms. A few progressive health insurance plans, such as Blue Shield of California and First Health

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[13] Fox S, et al. The online health care revolution: How the web helps Americans take better care of themselves. Web Page. URL: http://www.pewinternet.org/reports/toc.asp?Report=26. 9 July 2000.

[14] Bensing JM, Verhaak PFM, Van Dulmen AM, Visser AP. Communication: the relay pathway to patient-centered medicine. *Patient Education and Counseling*. 2000; 39: 1-3.

Group, are already utilizing these virtual office visit technologies to handle routine tasks that previously required a face-to-face visit with a physician.[15]

In addition to bringing patients closer to medical care providers, the Internet is being used to bring pharmaceutical care providers and patients closer together. Websites such as Advanceparadigm.com, Drugstore.com, and Merck-Medco.com. (recently renamed Medcohealth Solutions, Inc.) are examples of how the Internet is initiating changes in the U.S. pharmaceutical industry, enabling patients to experience greater control over these processes by allowing them improved convenience and access to pharmaceutical care services and drug information.

1.3 Internet Pharmacy Service

Though there is no standard definition of Internet pharmacy, combining some aspects of the definition of e-commerce provided by Kalkota and Whinston and mail service pharmacy provided by Reed, Internet pharmacy can be defined as: using the Internet to facilitate the sale or transfer of prescription and non-prescription medications, drug information, and pharmaceutical care services from a remote vendor to a patient.[16,17]

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[15] Rubin R. The virtual doctor will see you now: But have your credit card ready. *USA Today*. Monday, June 10, 2002: 1A.

[16] Kalakota R, Whinston AB. *Frontiers of Electronic Commerce*. Reading: Addison-Wesley Publishing Company, Inc, 1996.

Internet pharmacies generally fall into one of two classifications: the pure-play Internet pharmacy and the clicks-and-mortar or clicks-and-bricks Internet pharmacy.[18] The pure-play Internet pharmacy is characterized by the absence of any physical storefront. They do virtually all of their business online. An example of a pure-play Internet pharmacy includes Prescriptiononline.com. Though it may also be classified as a pure-play Internet pharmacy, Drugstore.com has a strategic partnership with a brick-and-mortar chain (RiteAid), allowing their patients to pick up prescriptions at RiteAid pharmacies across the country. Clicks-and-mortar Internet pharmacies differ from their pure-play counterparts in that they have at least one physical storefront pharmacy that allows for face-to-face interaction between pharmaceutical care providers and patients. Examples of clicks-and-mortar Internet pharmacies include CVS.com and Walgreens.com.

1.3.1 Internet Pharmacy Operations

Internet pharmacies operate using the following procedures:[19,20]

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[17] Reed E. *Mail-order Pharmacy in the United States--A Speical Report Prepared for the Louisiana Board of Pharmacy*. Baton Rouge: Ed Reed Organization, 1986: iii-iv.

[18] Schering Laboratories. *Pharmacy.Com: A Virtual Reality*. Kenilworth: Schering Laboratories, Inc, 2000.

[19] Landis NT. Virtual pharmacies boast easy access, privacy, safeguards. *American Journal of Health-System Pharmacy.* 1999;56:1174-1179.

1. The process begins when a patient creates an online account with the pharmacy. After submitting insurance and credit card information, customers can begin using the service. Though most patients use credit cards as their primary form of payment, they are also allowed to pay by check.
2. There are a number of different methods available for the submission of prescription drug orders for fulfillment. A physician or physician's agent may call or fax in (fax transmission may not be available in some states) new drug orders. Patients can mail the original prescription to the pharmacy. Patients may also request that a prescription be transferred from another pharmacy. Though not standard practice yet, technology exists that allows prescribers to directly transmit prescription orders from handheld personal digital assistants to an Internet pharmacy. Currently, Medcohealth Solutions is among one of the companies conducting such programs.[21] In 2001, Medcohealth processed 1.3 million electronic prescriptions.[22]
3. Upon receipt of a valid prescription, a pharmacist checks the prescription for accuracy. After the prescription is deemed accurate, appropriate drug

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[20] Henkel J. Buying Drugs Online: It's Convenient and Private, but Beware of 'Rogue Sites'. 2000. Web Page. URL: http://www.fda.gov/fdac/features/2000/100_online.html. 25 May 2000.

[21] Harris G. How Merck unit beat dot-coms in web foray. *The Wall Street Journal*. Thursday, April 13, 2000:B1,B4.

utilization review is performed to ensure that there are no drug-drug or drug-disease interactions and the medication order is filled. The order is then mailed to the patient. Some online pharmacies (clicks and mortar) allow patients to pick up their orders at a local drug store. If the mail option is chosen, the prescription is usually delivered to the patient within three to five days. Overnight shipping is usually available at an extra cost.

4. For new medication orders, patients are provided with written material accompanying their medication delivery that outlines the proper use of the medication, possible side effects, and instructions to follow in case of a missed dose. Prescription counseling, provided by a licensed pharmacist, is obtained via telephone by calling a toll-free number. Pharmacists can also be contacted via electronic mail.

1.3.2 History of Internet Pharmacy

The brief history of Internet pharmacy industry has been marked by a great deal of activity. Though only five years old, the industry has already seen a major industry-wide shake-down. The first pharmacy to conduct its primary business through online transactions was Soma.com, which launched its site in August of 1997. Within the months following the launch of Soma.com, its first competitors,

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[22] Anon. Internet ads will represent 10-30% of DTC by 2005, Medco exec predicts. *The Pink Sheet*. 2001;64(17):14.

Drugstore.com and Planetrx.com, launched Internet pharmacy sites of their own. After the entry of the first competitors, a flood of other pure-play Internet pharmacy websites burst onto the scene, fueled by an over-abundance of venture capital and estimates of spectacular growth in the broader e-health market. By October of 2000, there were 326 Internet pharmacy websites poised and ready to satisfy the needs of the expected deluge of online pharmacy consumers.[23]

Excitement in the Internet pharmacy sector raised the interest of many traditional brick-and-mortar companies. Soon after the pure-play Internet pharmacies appeared, many traditional brick-and-mortar chains, such as Walgreen's, Eckerd's, Longs and Wal-Mart launched Internet Pharmacy sites of their own. Also, consolidation and creative partnering agreements began to emerge. This stage saw the development of hybrid Internet pharmacies (clicks-and-bricks and other models).

Using a strategy that has become popularized by many retail department store chains, many traditional brick-and-mortar pharmacies adopted a clicks-and-mortar business model. The clicks-and-mortar strategy allows traditional brick-and-mortar pharmacies to draw upon established supplier relationships, customer bases, name recognition, and distribution systems to build a strategic advantage over their pure-play competitors, assuming that these factors help to ensure success in the Internet

[23] Gagnon JP. E-Pharmacy: fundamentals of e-business and implications for pharmacy service. Academy of Managed Care Pharmacy-Educational Conference. San Diego, California: Managed Care Primer; October 5, 2000.

pharmacy arena. Instead of relying on their Internet businesses as a primary source of revenue, these companies view the services provided through their websites as a value-added service for their traditional customers. Many of these brick-and-mortar hybrids will allow customers to pick-up their medications at one of their local pharmacy stores, providing face-to-face interaction with a pharmacist. This added benefit may represent a substantial competitive advantage over the pure-play Internet pharmacies. However, it is still uncertain whether this advantage will translate into market dominance in the online marketplace. In addition, there are a number of potential pitfalls that belie the successful implementation of a clicks-and-mortar strategy. The most challenging of these dilemmas is the internal competition and cannibalization of traditional business that occurs with companies that choose to pursue this strategy.

In addition to the traditional brick-and-mortar chains, mail-service pharmacy businesses are being transformed by the Internet pharmacy revolution. The first example of this occurred in October of 1998, when Merck-Medco, a mail-order pharmacy/pharmaceutical manufacturer/pharmacy benefits management company, launched its Internet pharmacy website.[24] Merck-Medco, recently renamed Medcohealth Solutions, has grown to become one of the most dominant and successful Internet pharmacy websites to date. During 2001, Merck-Medco's Internet

[24] Landis NT. Virtual pharmacies boast easy access, privacy, safeguards. *American Journal of Health-System Pharmacy.* 1999;56:1174-1179.

pharmacy operation filled more than 7.2 million prescriptions received via the Internet, and handled 20 million online customer service requests and inquiries.[25] In addition to its mail service business, Medcohealth operates a pharmacy benefit management (PBM) organization, which manages the drug benefit for over 50 million enrollees. The PBM and mail service beneficiaries provide Merck-Medco's Internet business with a large base of customers.[26,27]

Instead of developing their own Internet websites from the ground up, some pharmacy chains have chosen to partner with or buy an equity stake in existing Internet pharmacy websites. This strategy allows traditional pharmacies to maintain focus on their core-competencies. In addition, co-marketing strategies allow for both companies to expand their reach and capitalize on associations with brand equity and name recognition. For example, instead of building an Internet pharmacy website from the ground up, in June 1999, CVS purchased Soma.com.[28] This move represented the first brick-and-mortar buyout of a pure-play Internet pharmacy. In a similar move, Rite Aid pharmacy has partnered with Drugstore.com, purchasing a 25

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[25] Anon. Internet ads will represent 10-30% of DTC by 2005, Medco exec predicts. *The Pink Sheet.* 2001;64(17):14.

[26] Harris G. How Merck unit beat dot-coms in web foray. *The Wall Street Journal*. Thursday, April 13, 2000:B1,B4.

[27] Harris F: Merck-medco separates mail service from on-line pharmacy. *Drug Topics*. 1999;143:51

[28] Landis NT. Virtual pharmacies boast easy access, privacy, safeguards. *American Journal of Health-System Pharmacy.* 1999;56:1174-1179.

percent equity stake in Drugstore.com.[29] In another related strategic move, Express Scripts, a pharmacy benefit management company, purchased a 20 percent equity stake in Planetrx.com (an Internet pharmacy service provider which ceased operations in March of 2001).[30]

Within the past year, the industry has entered a more turbulent stage in its cycle of growth. Internet pharmacy websites that have failed to maintain a sustainable level of revenue have begun to leave the market. This may mark the turning point for the entire industry as it moves from its growth stage to the maturity stage. For example, in early 2001, two of the first Internet pharmacy service providers, Planetrx.com and RX.com, closed their doors for business. Though the future is somewhat uncertain, it is sure to involve some further consolidation as competitors continue to leave a market that will most likely be unable to tolerate an over-abundance of suppliers.

Despite the threat of further consolidation, the efficiencies that this mode of pharmacy provides make it highly unlikely that this mode of pharmacy service will disappear. As Internet use continues to become more widespread and advancements in web-interface technology improve the human-computer interaction, the use of

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[29] Harris G. How Merck unit beat dot-coms in web foray. *The Wall Street Journal*. Thursday, April 13, 2000:B1,B4.

[30] Anon. PlanetRx sets departure from the retail market. *Chain Drug Review*. February 26, 2001:1,4.

Internet pharmacy service and related Internet health service applications should continue to increase.

1.4 Legal and Regulatory Issues

Not long after the introduction of the first Internet pharmacies, regulatory agencies became active in developing guidelines to control the industry. Much of this regulatory effort was initiated in response to many unscrupulous Internet pharmacy sites that began to distribute prescription medications without valid prescriptions. Some of these sites partnered with physicians and offered valid prescriptions but required that the patient only complete a brief online questionnaire to receive medications. These sites bypass the traditional physician-patient relationship by offering prescription medications without an adequate medical history and physical examination, making it easy for any patient with a valid credit card account to acquire prescription medications—even controlled substances. Bypassing the safeguards that exist in a traditional physician-patient relationship can have fatal consequences for the patient. In one case, a 52 year-old patient in Illinois who had symptoms of angina and a family history of heart disease (contraindications for the use of Viagra®, Pfizer, Inc.) died of a heart attack in March of 1999 after obtaining prescriptions for the

impotence drug sildenefil (Viagra®, Pfizer, Inc.), online.[31] Recently, state boards of pharmacy are taking action against Internet pharmacies that allow customers access to prescriptions while bypassing traditional physician-patient relationships.[32]

These unscrupulous practices led to the Federal Trade Commission's (FTC) call for regulation of the online pharmacy industry in 1999.[33] Due to the safety issues presented by online pharmacies that fail to operate according to United States state and federal pharmacy laws, the FTC began to lobby for the introduction of legislation requiring online pharmacy businesses to disclose comprehensive information about their business practices. In cases where unethical prescribing is suspected, the FTC advocates full disclosure of information about the doctors that prescribe the medications that are dispensed.

In addition to the involvement of federal regulatory agencies, the prospect that the patient-physician relationship could become little more than an E-mail transaction has both medical and pharmacy regulatory agencies alarmed. The American Medical Association (AMA) has spoken out against this practice. The AMA asserts that legal

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[31] Henkel J. Buying Drugs Online: It's Convenient and Private, but Beware of 'Rogue Sites'. 2000. Web Page. URL: http://www.fda.gov/fdac/features/2000/100_online.html. 25 May 2000.

[32] Brice J. $90 million fines asked in Internet drug sales. Web Page. URL: http://www.bayarea.com/mld/cctimes/3356972.htm. 30 May 2002.

[33] Anon. FTC calls for regulation of online pharmacies. Webpage. URL: http://www.nua.ie/surveys/index.cgi?f=VS&art_id=905355077&rel=true. 25 May 2000.

drug prescribing can occur only after the formation of a bona fide patient physician relationship that is built upon a physical examination that involves physical contact with the patient.[34] To protect consumers, the National Association of Boards of Pharmacy (NABP) has developed a program to identify legitimate Internet pharmacy sites. Through this program, the NABP awards a Verified Internet Pharmacy Practice Site (VIPPS) seal to those Internet pharmacy sites that meet certain standards of practice (Appendix 1).[35] Currently, there are 14 Internet Pharmacy Sites that have been awarded the VIPPS seal. This program is intended to protect consumers' interests by identifying those sites that meet a high standard of quality and service.

Recently, the Federation of State Medical Boards, an organization which includes all 70 medical licensing boards in the U.S. and its territories, and individual State Boards of Pharmacy have taken disciplinary actions against a number of unscrupulous Internet pharmacy websites and the physicians who work in conjunction with them. Through the efforts of these groups, online pharmacy websites that are dispensing medications without legitimate prescriptions and physicians that provide

[34] Anon. Internet-based prescribing and dispensing trouble medical and pharmacy boards. *American Journal of Health-System Pharmacy.* 1999;56:500.

[35] Anon. VIPPS database search results. Webpage. URL: http://www.nabp.org/vipps/consumer/listall.asp. 5 March 2001.

prescriptions without developing a legitimate patient-doctor relationship have been reprimanded in Florida, Alabama, Texas, Oklahoma, and Arkansas.[36,37,38,39,40]

Sites that are based outside of the United States conduct other ethically questionable practices. Some of these sites offer products that are currently unapproved for use in the United States by the FDA.[41] In addition, they offer to deliver products at prices much lower than those available in the United States. As a result of some of these practices, a number of regulatory agencies, such as state medical boards, state pharmacy boards, the Food and Drug Administration, the

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[36] Dorshner J. Pharmacy license suspended. 2002. Web Page. URL: http://www.miami.com/mld/miamiherald/business/3400167.htm?template=contentModules/printstory.jsp. 5 July 2002.

[37] Anon. Alabama jury convicts operators of Internet drug retailer. 2002. Web Page. URL: http://www.ihealthbeat.org/members/basecontent.asp?contentid=22495&collectionid=100&program=1. 5 July 2002.

[38] Anon. Texas moves to close online pharmacy, levies $3.8M fine. 2002. Web Page. URL: http://www.ihealthbeat.org/members/basecontent_p.asp?collectionid=100&program=1&contentid=22404&programid=1. 5 July 2002.

[39] Anon. Oklahoma doctor convicted of illegal online prescribing. 2002. Web Page. URL: http://www.ihealthbeat.org/members/basecontent_p.asp?collectionid=100&program=1&contentid=22423&programid=1. 5 July 2002.

[40] Anon. Arkansas firm halts online prescribing activities at medical board's request. 2002. Web Page. URL: http://www.ihealthbeat.org/members/basecontent_p.asp?collectionid=100&program=1&contentid=22852&programid=1. 5 July 2002.

[41] Henkel J. Buying Drugs Online: It's Convenient and Private, but Beware of 'Rogue Sites'. 2000. Web Page. URL: http://www.fda.gov/fdac/features/2000/100_online.html. 25 May 2000.

Federal Trade Commission, U.S. Customs Service and the U.S. Postal Service, are rushing to develop laws and guidelines to regulate this growing industry. The most challenging aspects of developing these guidelines concern the question of jurisdiction. Since the Internet crosses traditional jurisdictional boundaries, it presents a problem for many of the traditional administrative authorities. For this reason, some propose federal regulation of these practices.

Another pressing regulatory issue that confronts the industry is the concern over privacy and confidentiality shared by many online consumers. In a study of 1,002 computer users age 45 or older, researchers investigated the readiness of these consumers to conduct business online.[42] They found that of the 437 participants who had purchased products online, 323 (74 %) were concerned about the privacy of Internet purchases, and of the 815 participants who had used the Internet, 628 (77%) were concerned about tracking of Internet activities without their permission. Another study revealed that 23 percent of consumers reported concerns over privacy as a reason for not purchasing medications online.[43] Debates over the broader issue of regulation of confidential health information on the Internet were a highly

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[42] AARP. *AARP National Survey on Consumer Preparedness and E-Commerce: A survey of computer usage age 45 and older*. Washington: AARP, 2000.

[43] Anon. Online drugstores a prescription for failure, according to InsightExpress. Online. InsightExpress, Inc. http://www.insightexpress.com/news/release_102000.htm. 12 November 2000.

publicized topic during the Clinton presidency and these debates are sure to continue well into President Bush's term.

1.5 Internet Pharmacy Benefits

The use of the Internet as a method to distribute prescription drugs as well as drug information carries along with it certain advantages for the patient as well as the pharmacy. For the consumer, Internet pharmacies provide the convenience of access to pharmacy services 24 hours-a-day, seven days a week. The services provided by these websites include: real-time order tracking, online review of medication profiles, access to drug-related health content, electronic mail refill reminders, and electronic mail or telephone access to a pharmacist 24 hours-a-day. These pharmacies provide home delivery of medications for patients who may encounter difficulty traveling, such as the disabled, the elderly, and those living in remote areas. Internet pharmacy service providers also offer a discrete method by which patients can obtain medications or pharmacy counseling for conditions that are associated with social stigma, such as human immunodeficiency virus infection, sexually transmitted disease, or mental illness. In addition, these companies can provide consumers with a level of customized service that can rival some traditional (brick-and-mortar) pharmacies. By tracking their customer preferences and studying shoppers' personal characteristics, these companies can send personalized electronic mail updates about newly approved medications, targeted health content, or medication refill reminders.

Moreover, information about a consumer's medical condition and over-the-counter and prescription drug purchases can be used to build unique startup pages that allow each consumer to experience a customized service interaction each time they visit the website.[44] This form of mass customization has become a common practice for e-commerce leaders, such as Amazon.com, building the experience of a unique, customized shopping experience.

Internet distribution of drugs represents a method of direct marketing. The Direct Marketing Association describes direct marketing as an interactive system of marketing, which uses one or more advertising media to affect a measurable response and/or transaction at any location.[45] By marketing medication directly to consumers, the pharmacy simplifies its channel of distribution, improving efficiencies and allowing it to capitalize on the benefits of economies of scale. The Internet allows one company, by way of a single virtual storefront, to access and serve customers from around the world, eliminating the need for numerous distribution outlets and reducing the cost associated with managing and servicing a vast drug distribution network. The benefits of such a system include greater efficiency and cost savings.

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[44] Landis NT. Virtual pharmacies boast easy access, privacy, safeguards. *American Journal of Health-System Pharmacy.* 1999;56:1174-1179.

[45] Direct Marketing Association Inc. *1982 Fact Book on Direct Response Marketing*. New York: Direct Marketing Association, Inc, 1982: xxiii.

1.6 Statement of Problem

A study on the growth of Internet pharmacy conducted in 2000 concluded that only two percent of consumers have used an online pharmacy service provider; analysts estimate this number to increase dramatically over the next decade.[46] Little research has been conducted to investigate what factors influence a consumer's decision to adopt Internet pharmacy service. A study of this type will increase our understanding of consumer adoption of Internet pharmacy service. In addition, this research may help healthcare decision-makers of the future understand how patients evaluate and adopt other web-enabled consumer health applications.

As a technological innovation, the Internet is a tool that allows businesses to forge new kinds of relationships with customers. In the field of pharmacy service, Internet pharmacies allow their patients increased access to service and information 24-hours a day from the comfort of their own homes at their own convenience. For healthcare providers and health systems, Internet pharmacy service represents an efficient inexpensive method to provide pharmaceutical care services to a large number of patients. It is one of the first widespread applications of web-technology in the field of healthcare. As Internet use grows, healthcare providers and health systems will inevitably become more reliant on web-based applications to disseminate information, communicate with patients, and provide services. As the

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[46] Schering Laboratories. *Pharmacy.Com: A Virtual Reality*. Kenilworth: Schering Laboratories, Inc, 2000.

push to develop more online healthcare applications continues, there is an increasing need for healthcare providers and health systems to understand the process by which consumers in the main market evaluate and adopt Internet healthcare applications.

Researchers in the field of innovation characteristics research and information technology acceptance have proposed a series of theoretical frameworks that model the process of innovation-adoption. These models have been shown to accurately predict intent to adopt and usage behavior in their respective fields. Currently, there is no published research that has examined consumer adoption of Internet pharmacy service using such a theoretical innovation-characteristics framework.

1.7 Statement of Objectives

To date, empirical research on the acceptance of Internet pharmacy service has been limited. No attempt has yet been made to analyze adoption of this innovative service offering within the context of a theoretical model.

Using a theoretical model adapted from two models in the fields of innovation-characteristics research and technology acceptance, this study will analyze the relationships between intent to adopt Internet pharmacy service and selected variables (perceived relative advantage, perceived simplicity, perceived compatibility, perceived risk, attitude towards Internet pharmacy service use, subjective norm

towards Internet pharmacy service use, total family income and formal education level).

The purpose of this research will be to assess the relative importance of each of the independent variables in the prediction of the intent to adopt Internet pharmacy service. Such insight will be valuable to health systems that intend to implement initiatives that involve the use of Internet pharmacy service to provide pharmaceutical care services to patients in the mainstream market.

1.8 Overview of Thesis

Drawing upon the literature on diffusion of innovations, information technology acceptance, in-home shopping, and pharmacy patronage, a model that describes adoption of Internet pharmacy service will be developed. This model will identify relevant constructs and the proposed relationships that these constructs have with each other and the intent to adopt Internet pharmacy service. In Chapter 2, a review of the diffusion of innovations, in-home shopping, risk perception, and pharmacy patronage literature will be presented. Based on the findings in this literature review, a research model will be constructed. In Chapter 3, the research model will be specified and the relationships between variables will be hypothesized. In Chapter 4, the research methodology will be presented. In Chapter 5, the study results will be presented. Finally, Chapter 6 will provide a discussion of the results

and limitations of this research. Suggestions for future research endeavors will also be included in this chapter.

CHAPTER 2: LITERATURE REVIEW

The research model will be theoretically grounded in the literature of three different disciplines. Drawing primarily from research conducted in the diffusion of innovations, the model will also rely upon constructs taken from the in-home shopping and pharmacy patronage literature. The literature will be used to guide not only theory development, but also, it shall aid in the operationalization of the relevant constructs of the theoretical model.

2.1 Diffusion of Innovations Perspective

The Internet pharmacy adoption model will draw heavily upon the diffusion of innovations literature. This field of research has accomplished a great deal in advancing the understanding of the diffusion of new products and services. Research from this field has examined how consumer perceptions of innovations influence the adoption of high-technology and information systems innovations. In addition, this literature has examined how the personal characteristics of potential adopters influence the adoption of innovations. Innovation-adoption models previously studied in this field will form the basis of the research model used in this study. Since Internet pharmacy service is still in the early stages of its diffusion, using a research model based upon classic diffusion of innovations theory will shed much needed light upon its ongoing diffusion. What follows is a review of the literature on innovation characteristics and innovativeness.

2.1.1 Innovation Characteristics

Rogers defines an innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption."[47] Of primary interest to those who bring innovations to market and those who attempt to derive value or competitive advantage from these innovations, is the way in which these innovations are spread and adopted by members of a social system. The way in which prospective adopters evaluate these innovations and how their perceptions affect adoption has been the subject of over 4,000 research studies.[48]

According to marketing diffusion theory, an individual's decision to adopt an innovative product or service relies heavily upon how that individual perceives certain innovation-specific characteristics. A large amount of research effort has been devoted to the study of these perceived attributes and to which are most important in determining the rate of adoption.[49] After reviewing thousands of innovation studies, Rogers identified five innovation-specific characteristics that influence consumer adoption of innovation. These Rogersian attributes include: relative advantage, compatibility, simplicity (which is sometimes measured as its conceptual opposite,

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[47] Rogers EM. Diffusion of Innovations. fourth ed. New York: The Free Press, 1995: 11.

[48] Ibid., xv.

[49] Ibid., 204.

complexity), trialability or divisibility and observability or communicability.[50] As was first suggested by Bauer, many researchers have gone on to add perceived risk to this list of perceptual beliefs.[51,52,53,54,55] A list of the Rogersian characteristics and perceived risk along with their respective definitions and relationships to adoption are displayed in Table 1.

[50] Ibid., 207.

[51] Bauer RA. Consumer Behavior and Risk Taking. *Proceedings of the Educators' Conference 1960*. 1960. 389-98.

[52] Ostlund LE. Perceived innovation attributes as predictors of innovativeness. *Journal of Consumer Research*. 1974;1:23-29.

[53] Labay DG, Kinnear TC. Exploring the consumer decision process in the adoption of solar energy systems. *Journal of Consumer Research.* 1981;8:271-278.

[54] Holak SL. Determinants of innovative durables adoption: An empirical study with implications for early product screening. *Journal of Product Innovation Management.* 1988;5:50-69.

[55] Holak SL, Lehmann DR. Purchase intentions and the dimensions of innovation: An exploratory model. *Journal of Product Innovation Management*. 1990;7:59-73.

Table 2.1. Description of Innovation Characteristics and Their Relationship with Adoption of Innovation

Characteristic	Definition	Relationship with Adoption
Relative Advantage	The degree to which an innovation is perceived as better than the idea it supersedes.	Positive
Compatibility	The degree to which an innovation is perceived as being consistent with the existing values, past experiences and needs of potential adopters.	Positive
Simplicity	The degree to which an innovation is perceived as easy to understand and use.	Positive
Trialability	The degree to which adopters perceive an innovation may be experimented with on a limited basis.	Positive
Observability	The degree to which adopters perceive the results of an innovation are visible to others.	Positive
Perceived Risk	The degree to which risks are perceived as associated with the innovation.	Negative

Adapted from Rogers, 1995 and Bauer, 1960

Internet pharmacy service represents a major technological innovation in the field of health care. It represents the culmination of several technological innovations that began with the introduction of the personal computer. The diffusion of innovations literature provides an excellent theoretical framework with which to examine the adoption of Internet pharmacy service. The diffusion of innovations literature provides careful insight into two important aspects of adoption: 1) consumer

perceptions of innovations and how they shape the innovation-decision, and 2) the characteristics of consumers that are more likely to adopt technological innovations. What follows is a brief review of pertinent literature on both these issues.

2.1.1.1 Review of Studies

One of the first marketing studies that examined the effect of perceptual variables on innovation adoption was conducted by Ostlund.[56] In a study of the adoption of an innovative food product among 360 housewives, Ostlund hypothesized that the perceived Rogersian innovation attributes and perceived risk would be better predictors of early product purchase than demographic characteristics. Using multiple discriminant function analysis, Ostlund analyzed the effect of 13 personal characteristics and six product-specific characteristics (listed in Table 2.2) on aided and unaided recall of purchasing an innovative food product.

[56] Ostlund LE. Perceived innovation attributes as predictors of innovativeness. *Journal of Consumer Research*. 1974;1:23-29.

Table 2.2. Description of Ostlund's Personal and Innovation Characteristics Variables

Variable	Definition
Personal Characteristics	
Venturesomeness	Willingness to take risks in buying new products
Cosmopolitansim	Degree of orientation beyond a particular social system
Social Integration	Extent of social participation with other members of the community
Privilegedness	Perceived financial well-being relative to peers
Interest Polymorphism	Variety and extent of one's personal interests
General Self-Confidence in Problem-Solving	Perceived ability to cope with day to day problems
General Self-Confidence in Psychosocial Matters	Perceived ability to cope with other's opinions of one's decisions
Family Income	Total family income
Respondent Education	Years of formal education
Occupational Status of Husband	Social occupational status, measured by the Duncan Scale
Respondent Age	Age of respondent in years
Perceived Innovation Characteristics	
Relative Advantage	The degree to which an innovation is perceived as superior to ideas it supercedes
Compatibility	The degree to which an innovation is perceived as being consistent with the existing values, past experiences and needs of potential adopters.
Simplicity	The degree to which an innovation is perceived as easy to understand and use.
Trialability	The degree to which adopters perceive an innovation may be experimented with on a limited basis.
Observability	The degree to which adopters perceive the results of an innovation are visible to others.
Perceived Risk	The degree to which risks are perceived as associated with the innovation.

Adapted from Ostlund, 1975

The effect of including only the perceived innovation attributes in the discriminant function was tested against the inclusion of all variables to determine the additive predictive power of including personal characteristics into the model. In both unaided and aided recall models, the inclusion of personal characteristics increased the proportion of buyers correctly classified in the validation sample by only 1 and 2 percent, respectively. The rank order of importance for the perceived innovation characteristics is listed in Table 2.3. In this study, Ostlund concluded that when compared to the perceived innovation characteristics, "personal characteristics variables were unimportant predictors."[57]

Table 2.3. Relative Importance of Perceived Innovation Attributes in the Discriminant Function

Variable Name	Standardized Discriminant Function Coefficient
Relative Advantage	23.46
Compatibility	22.32
Complexity	-14.72
Perceived Risk	-12.74
Observability	1.20
Trialability	0.14

Adapted from Ostlund, 1974

[57] Ibid., 26.

In a follow up study, Ostlund analyzed the effect of perceptual variables and personal characteristics on the innovativeness of consumers who purchased a cooking innovation.[58] In this study, Ostlund classified innovators as those consumers who purchased the innovation within three months after the introduction of the product. Using discriminant function analysis, Ostlund analyzed the effect of five personal characteristics and six product-specific characteristics on actual purchasing behavior. The number of personal characteristics was decreased in this study due to an earlier factor analysis that revealed redundancy among some of the 13 variables analyzed in the first study.[59] The effect of including all predictor variables and only the perceived innovation attributes was tested to determine the additive predictive power of including the personal characteristics. The multiple discriminant function consisting of perceptual variables correctly predicted group membership in 77 percent of the validation sample, while the function containing all predictor variables correctly predicted group membership in 79 percent of the validation sample. Consistent with the findings of Ostlund's first study, the way in which consumers perceived innovations along the Rogersian dimensions were of primary importance in predicting innovative buying, while personal variables were of marginal importance in improving prediction.

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[58] Ibid., 26-29.

[59] Ostlund LE. Factor analysis applied to predictors of innovative behavior. *Decision Sciences.* 1973;4:92-101.

To compare the efficiency of predictive adoption models based on perceived attributes and demographic variables, Labay and Kinnear conducted a study of 631 adopters and non-adopters of solar energy heating systems.[60] The variables of interest included all five Rogersian attributes (relative advantage, simplicity, compatibility, trialability, and observability), risk perception, age, education level, income, family life cycle and occupational status. The researchers found no significant differences in demographic variables between adopters of solar energy heating systems and non-adopters. However, adopters reported lower scores on perceived complexity (1.39 versus 1.97; $p<0.05$) and observability (5.84 versus 6.43; $p<0.05$) compared to non adopters. Two multiple nominal scale analysis models were constructed, one containing demographic variables and the other containing perceived attributes, to compare the effectiveness of these variables in predicting adoption. Overall, the attribute perception model proved to be superior to the demographic variable model in predicting group membership in the holdout sample (57% versus 37% correctly classified; $p<0.005$). Consistent with the findings of Ostlund, Labay and Kinnear concluded that perceived innovation attributes drove the innovation-adoption decision.

To assess the consistency of empirical findings in the field of innovation characteristics research, Tornatzky and Klien conducted a meta-analysis of 75

[60] Labay DG, Kinnear TC. Exploring the consumer decision process in the adoption of solar energy systems. *Journal of Consumer Research.* 1981;8:271-278.

innovation characteristics studies to examine which specific attributes exhibited consistent effects on the adoption of innovations.[61] The results of this meta-analysis revealed that only three characteristics were significantly associated with adoption at the alpha level of 0.10. These three characteristics were: relative advantage ($p = 0.031$), compatibility ($p = 0.046$) and complexity ($p = 0.062$). These findings suggested that these three characteristics should form the basis of any research investigating adoption of innovation or the innovation-decision process. Tornatzky and Klien also reported that the empirical diffusion literature was lacking in any systematic method for the measurement of perceived innovation characteristics, and they supported the development and use of standardized, validated scales with which to capture user perceptions. Further, these researchers advocated the development of standardized scales for the measurement of user perceptions that could be applied across a wide variety of research settings.

To gain a better understanding of consumer adoption of high technology durable consumer products, Holak conducted a study to investigate the impact of perceived product attributes, environmental variables (e.g., price and expected price), and consumer traits (e.g., interest in product class and acquisitiveness) on purchase intention for nineteen different technology intensive products from four different

[61] Tornatzky LG, Klein KJ. Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IEEE Transactions on Engineering Management*. 1982;29:28-45.

product categories (photography, entertainment, kitchen appliances, and electronics).[62] The dependent variables included all five Rogersian innovation attributes, perceived risk, consumer traits, and environmental variables.

Holak tested the effect of these variables on intent to adopt using four linear nested models:

Model 1: Intention = f(6 Perceived Product Attributes)

Model 2: Intention = f(Model 1 + 6 environmental variables)

Model 3: Intention = f(Model 2 + 2 consumer traits)

Model 4: Intention = f(Model 3 + 17 interactions)

In general, perceived innovation attributes dominated all other variables except in the cases of photographic and kitchen appliance groups where more complex interaction terms tended to dominate. The standardized parameter estimates for the five Rogersian attributes and perceived risk are listed in Table 2.4. For all innovations studied, the parameter estimates for relative advantage were consistently positive and significant. The parameter estimates for compatibility were significant only for innovations in the entertainment ($\beta = 0.360$; $p < 0.05$) and electronics group ($\beta = 0.041$; $p < 0.05$). The only significant parameter estimate for complexity was to be found in the kitchen item group ($\beta = 0.20$; $p < 0.05$). Although parameter

[62] Holak SL. Determinants of innovative durables adoption: An empirical study with implications for early product screening. *Journal of Product Innovation Management.* 1988;5:50-69.

estimates for perceived risk were negative in most cases, except for photographic innovations ($\beta = 0.19$), the only significant parameter estimate for risk was in the entertainment innovation group ($\beta = -0.150$). The consumer traits and the environmental variables studied failed to have a substantial or consistently significant impact on intent to adopt. Holak concluded that, across product groups, perceived innovation attributes tend to dominate all other predictor variables; however, the relative importance of the effect of the various dimensions of perceived innovation attributes changes with respect to the product class under examination.

Table 2.4. Parameter Estimates of Purchase Intention Models

Perceived Attribute	Photographic β (t-value)	Entertainment β (t-value)	Kitchen β (t-value)	Electronic β (t-value)
Relative Advantage	0.44*	0.25*	0.53*	0.17*
	(3.29)	(7.87)	(2.39)	(3.19)
Compatibility	-0.03	0.360*	-0.07	0.41*
	(-0.27)	(10.88)	(-0.34)	(7.50)
Complexity	0.09	-0.005	0.20*	-0.03
	(0.66)	(-0.15)	(1.71)	(-0.49)
Divisibility	0.21	-0.01	0.02	0.02
	(1.57)	(-0.33)	(0.08)	(0.45)
Communicability	0.08	-0.03	-0.24	-0.02
	(0.61)	(-0.97)	(-1.25)	(-0.37)
Perceived Risk	0.19	-0.15*	-0.13	-0.07
	(1.55)	(-4.81)	(-0.37)	(-1.37)

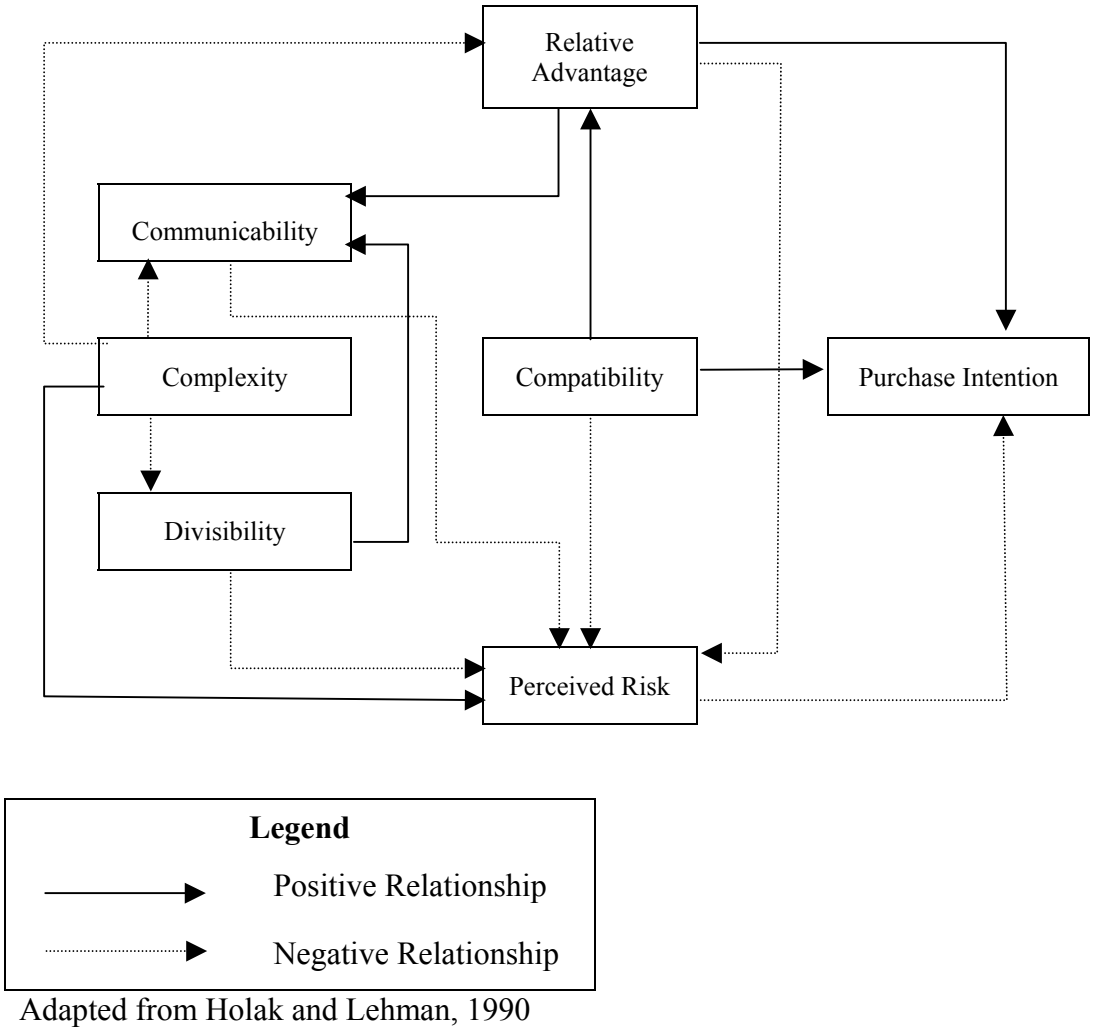
* = $p < 0.05$
Adapted from Holak, 1988

In a similar study, Holak and Lehmann further examined the impact of the five Rogersian attributes and perceived risk on the intention to adopt consumer durable innovations.[63] Using the same 19 innovations examined in Holak's previous work, a path model was proposed that specified the nature of the effects of communicability, complexity, divisibility, relative advantage, compatibility, and perceived risk upon purchase intent (Figure 2.1). This model proposed that the effects of communicability, complexity and divisibility were mediated by their

[63] Holak SL, Lehmann DR. Purchase intentions and the dimensions of innovation: An exploratory model. *Journal of Product Innovation Management*. 1990;7:59-73.

influence upon relative advantage, compatibility and perceived risk. For all products included in this analysis, except for the relationship between complexity and relative advantage, the results of the parameter estimation procedures supported the hypothesized relationships predicted by the authors. Multiple regression analysis revealed that risk, relative advantage and compatibility explained 60 percent of the variance of purchase intention ($p < 0.0001$). The results of this analysis are displayed in Table 2.5. One of the important conclusions made by the authors was that the product purchase evaluation process was driven by the perceived compatibility of the item, due to the large relative magnitude and significance of its contribution to purchase intent.

Figure 2.1. Holak's Model of Consumer Durables Adoption



Adapted from Holak and Lehman, 1990

Table 2.5. Multiple Regression Results for Risk, Relative Advantage and Compatibility on Purchase Intention for All Products

Independent Variable	β	p-level
Risk	-0.09	0.0001
Relative Advantage	0.24	0.0001
Compatibility	0.42	0.0001

Adapted from Holak and Lehman, 1990

Using the five Rogersian innovation characteristics as a framework, Agarwal and Prasad investigated the relationship between the innovation characteristics, result demonstrability, image and voluntariness upon current and predicted future use intentions of the World Wide Web (WWW).[64] What Agarwal and Prasad discovered was that the predictors of current use and intended future use differed considerably. While the innovation characteristics of compatibility ($\beta = 0.31$; $p < 0.01$), visibility ($\beta = 0.29$; $p < 0.01$), trialability ($\beta = 0.19$; $p < 0.05$), and voluntariness ($\beta = -0.27$; $p < 0.01$) were important predictors of current use, the only important predictors of continued future use were relative advantage ($\beta = 0.49$; $p < 0.01$) and result demonstrability ($\beta = 0.34$; $p < 0.01$). Therefore, while compatibility, visibility, and voluntariness are the primary determinants of initial use of the WWW, continued use is best predicted by its relative advantage (the degree to which the innovation

[64] Agarwal R, Prasad J. The role of innovation characteristics and perceived voluntariness in the acceptance of information technologies. *Decision Sciences.* 1997;28:557-582.

provides an advantage over conventional methods of conducting similar tasks) and demonstrability (tangibility of the results of using the innovation). These findings suggests that there may be a need to develop different models to explain initial use and continued future use, as the relevant predictors may differ substantially.

2.1.1.2 Technology Acceptance Model

Using a theoretical foundation based upon the diffusion of innovations literature, Davis extended empirical research on perceptual variables in the field of Information Technology with the development of the Technology Acceptance Model (TAM), which examines the relationships between user perceptions and use of innovative computer applications.[65,66] Davis's original TAM is depicted in Figure 2.2. The TAM suggests that actual system use is directly dependent upon behavioral intent to use the system. Behavioral intent, in turn, is dependent upon both usefulness and attitude towards using the system. Attitude toward using the system is dependent upon perceived usefulness and ease of use. The two perceptual variables, usefulness and ease of use, are constructs that are conceptually congruent with the Rogersian

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[65] Davis FD. *A Technology Acceptance Model for Empirically Testing New End-User Information Systems: Theory and Results*. Doctoral Dissertation. MIT Sloan School of Management, 1986.

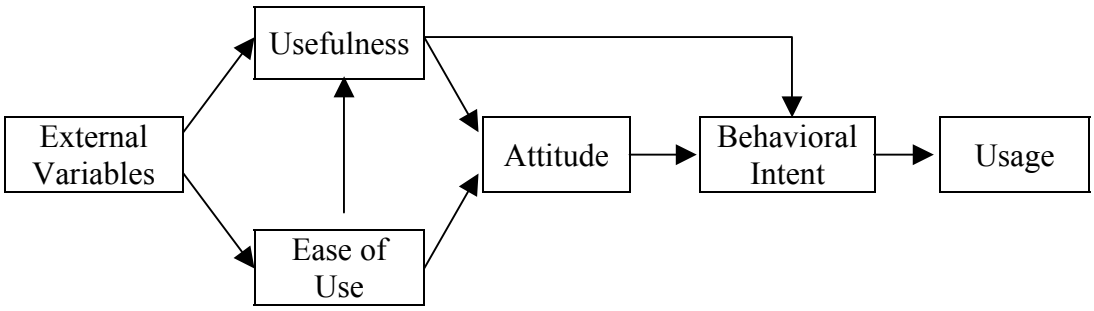
[66] Davis FD. User acceptance of information technology: system characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies.* 1993;38:475-87.

innovation attributes relative advantage and complexity, respectively.[67,68] Due to its relationship to other models of adoption that are based on perceived innovation characteristics and its use in modeling the adoption of various computer applications, a brief review of the TAM literature is warranted.

[67] Moore G, Benbasat I. Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*. 1991;2:192-222.

[68] Keil M, Beranek PM, Konsynski BR. Usefulness and ease of use: field study evidence regarding task considerations. *Decision Support Systems.* 1995;13:75-91.

Figure 2.2. Davis's Technology Acceptance Model



Adapted from Davis, 1993

To gain a better understanding of the effects posited by the TAM, Davis, Bagozzi and Warshaw conducted a study to compare the effectiveness of the TAM versus the Theory of Reasoned Action (TRA), which posits that behavioral intentions are influenced by both attitudes and subjective norm (SN), in predicting user intentions to use a word processing application.[69] Subjective norm is defined by Ajzen and Fishbein as a "person's perception that most people who are important to him think he should or should not perform the behavior in question."[70] In this study, TRA and TAM both explained a significant proportion of the variance that was observed in Behavioral Intent (BI). Based on questionnaires that were completed right after the introduction of a word processing application and 14 weeks later, TRA explained 32 percent ($p < 0.001$) of the variance in BI at time 1 and 26 percent ($p < 0.001$) at time 2, while TAM explained 47 percent ($p < 0.001$) of the variance in BI at time 1 and 51 percent ($p < 0.001$) at time 2. Also, this study indicated that BI was a substantial predictor of system use with behavioral intent at time 1 explaining a significant proportion of system use at time 2 ($R^2 = 0.12$, $\beta = 0.35$; $p < 0.001$). Interestingly, SN had a negligible and insignificant effect on BI at time 1 ($\beta = 0.07$; $p > 0.05$) and time 2 ($\beta = 0.10$; $p > 0.05$), while attitude (A) exhibited a large effect on

[69] Davis FD, Bagozzi RP, Warshaw PR: User acceptance of computer technology:A comparison of two theoretical models. *Management Science*. 1989;35:982-1003.

[70] Fishbein M, Ajzen I. *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley, 1975: 6.

BI at time 1 (β= 0.55; $p < 0.001$) and time 2 ($\beta = 0.48$; $p < 0.001$). Using the TAM, the researchers observed that usefulness (U) appeared to exhibit a powerful effect on BI above and beyond that of A, demonstrating that U may have an explanatory influence on BI that is superior to that of A and SN. Interestingly, this study demonstrated that, using the TAM, a much larger contribution toward BI was observed with U ($\beta = 0.48$; $p < 0.001$) than with A ($\beta = 0.27$; $p < 0.01$), underscoring the importance of Usefulness in the TAM. Both the TRA and the TAM were supported by this study; however, their results indicate that the more parsimonious TAM may be preferable in predicting adoption of innovative information technology applications.

To validate the findings of Davis, Bagozzi and Warshaw, Adams, Nelson and Todd conducted two replication studies of user perceptions and use of voice mail, electronic mail, word processing, spreadsheet and graphics systems.[71] In their first study, Adams, Nelson and Todd examined the effect of ease of use (EOU) and usefulness (U) upon the actual use of two different innovative messaging systems by employees across ten different organizations. The coefficients of determination for the electronic mail and voice mail models were 0.155 and 0.17, respectively. Examination of path coefficients indicated that usefulness was the key determinant of

[71] Adams D, Nelson R, Todd P. Perceived usefulness, ease of use, and usage of information technology: a replication. *MIS Quarterly.* 1992;16:227-250.

usage in both models ($\beta = 0.36$, $t = 2.6$ for electronic mail and $\beta = 0.31$, $t = 1.82$ for voice mail). The path coefficient for ease of use was not found to be significant for either data set. This finding paralleled the findings of Davis et al. In both cases, usefulness was a more powerful determinant of the dependent variable (intent to use or actual system use) than ease of use.

In the second study, Davis's TAM was employed to examine the use of three different business software applications: WordPerfect™(WP), Lotus 1-2-3™(L), and Harvard Graphics™(HG) in 73 undergraduate and MBA students. The coefficients of determination for each of the models were 0.04, 0.35 and 0.29 for the WP, L and HG models, respectively. For the WP model, only the ease of use to usage path was found to be statistically significant ($\beta = 0.21$, $t = 2.46$) with the usefulness to usage path found to be insignificant ($\beta = -0.03$, $t = -0.42$). For the L model, the usefulness to usage path was significant ($\beta = 0.846$, $t = 2.97$) and the ease of use to usage path approached statistical significance ($\beta = -0.4$, $t = -1.8$). The results for the HG model indicate an ease of use to usage path that also approached statistical significance ($\beta = 0.48$, $t = 1.8$) and an insignificant usefulness to usage path ($\beta = 0.06$, $t = 0.24$). The researchers concluded that the TAM was an appropriate model for the study of information technology usage; however, some inconsistencies between these results and the earlier results of Davis, Bagozzi and Warshaw raise some interesting issues. The researchers proposed that one explanation for the low explanatory power of the TAM in the case of the WP model was the occurrence of captive use. The

researchers believed that, though the use of WP was not required for the students, its use had indeed become a "defacto standard." This would explain the low explanatory power of the WP model and the low path coefficient for usefulness to usage. The negative ease of use to usage path was thought to be a result of the lesser importance of ease of use in post-adoption usage. The researchers concluded that the importance of the ease of use as an explanatory factor in the use of innovative technologies is dependent upon where the user is in the adoption-implementation continuum. That is, early in the use of a new product the ease of use construct is a significant predictor of usage, but with prolonged exposure to the innovation, ease of use no longer becomes an important variable in determining use. This was partially supported by an analysis of the mean months of experience for each of the users, which indicated that in contrast to HG users, who had reported using the product for a mean of 13 months, L and WP users had reported using these applications for 33 and 28 months, respectively. Otherwise, the discrepancy in the relative importance of each of the predictor variables across models underscores the fact that future researchers should practice caution when generalizing the results of adoption studies across product classes.

Davis conducted a follow up study that further strengthened the hypothesized relationships specified by the TAM.[72] This study was conducted to test the TAM in 112 users of two different information technology applications: an electronic mail system and a text editor. The dependent variables in this analysis were actual system use and attitude toward using the system. The results of a multiple regression analysis revealed that, as expected, attitude toward using ($\beta = 0.21$; $p < 0.05$) was significantly correlated with system use. In addition, perceived usefulness ($\beta = 0.65$; $p < 0.001$) and perceived ease of use ($\beta = 0.13$; $p < 0.05$) were both significantly correlated with attitude toward system use. Perceived usefulness ($\beta = 0.44$; $p < 0.001$) demonstrated a relatively large, significant correlation with actual system use, confirming the results of his previously published work.[69] In addition, as previously discovered, perceived usefulness (0.44; $p < 0.001$) exhibited a considerably larger direct effect upon actual system use than attitude toward using (0.21; $p < 0.05$).

Using an augmented version of the TAM, Taylor and Todd examined the effects of social influences and perceived behavioral control upon use of a student computing information resource center (CRC).[73] To analyze the effect of experience upon the variables of the model, Taylor and Todd calculated the parameter estimates

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[72] Davis FD. User acceptance of information technology: system characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies.* 1993;38:475-87.

[73] Taylor SA, Todd PA. Understanding information technology usage: a test of competing models. *Information Systems Research.* 1995;6:144-176.

for two models—one including a sample of students with prior experience using the CRC (n = 430) and another including a sample of students without prior experience using the CRC (n = 356). To model social influence, the augmented TAM included subjective norm as a direct predictor of behavioral intention. Perceived behavioral control was included as a direct predictor of both intent to use and actual use. To test for differences in the strength of path coefficients between the two groups, multi-sample LISREL 8 was used.[74] Parameter estimates for the augmented TAM were calculated for both samples of students. The model predicted 43 percent and 60 percent of the variance in intention to use for the experienced and inexperienced groups, respectively. In general, the significance of path coefficients were as expected from previous studies using the TAM. However, the direct path between attitude and behavioral intention was not significant. The direct path from perceived usefulness to attitude was significant ($\beta = 0.39$; $p < 0.001$ and $\beta = 0.90$; $p < 0.001$ for experienced and inexperienced groups, respectively). In addition, the link between ease of use and perceived usefulness was found to be significant ($\beta = 0.43$; $p < 0.001$ and $\beta = 0.22$; $p < 0.001$ for experienced and inexperienced groups, respectively). For the experienced students, the only significant predictor of attitude was perceived usefulness ($\beta = 0.85$; $p < 0.001$). For inexperienced students, both perceived usefulness and ease of use were significant predictors of attitude ($\beta = 0.80$; $p < 0.001$

[74] Joreskog K, Sorbom D: LISREL 8: *Structural Equation Modeling with the SIMPLIS Command Language*. Chicago: Scientific Software, 1993.

and $\beta = 0.21$; $p < 0.001$, respectively). Subjective norm exhibited a significant direct effect upon behavioral intent in the case of both the experienced and inexperienced users ($\beta = 0.09$; $p < 0.05$ and $\beta = 0.16$; $p < 0.001$, respectively). Also perceived behavioral control exhibited a significant direct effect upon behavioral intent in the case of both experienced and inexperienced users ($\beta = 0.50$; $p < 0.001$ and $\beta = 0.16$; $p < 0.001$, respectively). The effect of perceived behavioral control upon behavior was not consistent among experienced and inexperienced users, with the only significant effect occurring in the case of inexperienced users ($\beta = 0.19$; $p < 0.001$).

This study concluded that the TAM was a reasonable model for the examination of system use in both experienced and inexperienced users. The authors concluded that experience might moderate the effects of many of the variables included in the model. Specifically, the effect of perceived ease of use, attitude and perceived behavioral control appear to be modified by the effect of experience.

Another TAM replication study, conducted by Szajna, investigated the utility of the TAM in predicting self-reported and actual use of an electronic mail system by graduate business students.[75] Using path analysis, Szajna found that 52 percent of the variance in intent to use was explained by perceived usefulness and perceived ease of use. While perceived usefulness ($\beta = 0.72$; $p < 0.001$) had a significant direct effect on intention to use, perceived ease of use did not exhibit a significant direct effect

[75] Szajna B. Empirical evaluatioin of the revised technology acceptance model. *Management Science.* 1996;42(1):85-92.

upon intent to use. However, ease of use did exert a significant direct effect upon perceived usefulness ($\beta = 0.48$; $p < 0.01$), indicating an indirect influence upon intent through perceived usefulness (total effect = 0.35). One major finding of this study was the surprisingly low effect of intent upon actual usage. While pre-implementation intent appeared to exhibit a substantial effect upon measures of post-implementation self-reported use ($\beta = 0.28$; $p < 0.05$), when actual usage was measured, by analyzing computer logs of actual messages sent, the effect of pre-implementation intent was not significant ($\beta = 0.20$, NS). However, caution should be applied when interpreting this finding. These researchers failed to consider the external factors surrounding the use of the E-mail system. More specifically, the effect of opportunity to use the innovation was assumed to be equal among the entire sample. Despite an individual's high intent to utilize the system, actual usage patterns may appear to be low if there is a lack of opportunity to utilize the system. This may result in low intent to use correlations.

In a study of 76 students without prior experience using the World-Wide Web (WWW), Morris and Dillon used Davis's original TAM to predict usage of an innovative WWW browser.[76] The relationships among variables were tested using multiple regression analysis. The results of their analyses are displayed in Table 2.6. The researchers found statistical support for most of the hypothesized relationships

[76] Morris MG, Dillon A. How user perceptions influence software use. IEEE Software. 1997;July/August:58-64.

posited by Davis's original TAM with p-values ranging from $p = <0.001$ to $p = 0.007$. The only relationship not supported was the effect of ease of use upon usefulness ($\beta = 0.188$; $p = 0.58$).

Table 2.6. Multiple Regression Results of Hypothesized Relationships of TAM

Hypothesized Relationship	β	Standard Error of β	t	p	R^2
EOU to U	0.188	0.098	1.922	0.058	0.047
U to A	0.256	0.066	3.899	< 0.001	0.285
EOU to A	0.159	0.057	2.796	0.007	0.285
U to BI	0.322	0.780	4.118	< 0.001	0.186
A to BI	0.401	0.128	3.123	0.002	0.960
BI to Use	1.920	0.464	4.136	<0.001	0.188

EOU = Ease of Use
U = Usefulness
A = Attitude
BI = Behavioral Intention
Adapted from Morris and Dillon, 1997

In another study that used the TAM as a framework, Green explored how subjective norm and normative power influenced the use of a series of software products designed to improve productivity.[77] Green tested the effectiveness of a modified TAM in predicting system use in groups with low or high normative power. Normative power is a concept that represents degree of influence that results from identifying oneself as part of a group. Normative power is a function of the intensity of the group's approval of a target behavior (e.g., adoption of a new product) and the degree of consensus that the group has achieved with regard to the target behavior.

[77] Green CW. Normative influence on the acceptance of information technology. *Small Group Research.* 1998;29:85-123.

The most notable way in which Green's model diverged from the original TAM was in the introduction of subjective norm as a direct predictor of both system use and perceived usefulness. The effect of perceived usefulness upon system usage was significant for both groups with low and high normative power ($\beta = 0.23$; $p < 0.10$ and $\beta = 0.22$; $p < 0.10$, respectively); however, this result was only significant at the alpha < 0.10 level. In groups with low normative power, perceived importance, a construct similar to perceived usefulness, was found to exhibit a significantly positive effect on software use ($\beta = 0.49$; $p < 0.05$). The effect of perceived ease of use upon system usage appeared to depend upon the normative power of the group, with a significant effect occurring only in groups with high normative power ($\beta = 0.53$; $p < 0.05$). Subjective norm was found to have a significant positive effect on system use in groups with high normative power ($\beta = 0.24$; $p < 0.05$). These results indicate that subjective norm may indeed have an effect on influencing the use of innovative technologies. More specifically, it appears that this effect is stronger in cases where groups have a high degree normative power.

Al-Gahtani and King conducted another study confirming the relationships posited by the TAM.[78] Using a modified version of the TAM, these researchers analyzed the actual use of a spreadsheet application. In general, an examination of

[78] Al-Gahtani SS, King M. Attitudes, satisfaction and usage: factors contributing to each in the acceptance of information technology. *Behaviour & Information Technology*. 1999;18:277-297.

the effect of independent variables on usage confirmed the structure of the original TAM with the effects of user perceptions on usage channeled through attitude. The only independent variables that exhibited a significant direct effect upon usage were training ($\beta = 0.177$; $p < 0.01$), compatibility ($\beta = 0.334$; $p < 0.01$), system quality rating ($\beta = 0.192$; $p < 0.01$), and attitude ($\beta = 0.306$; $p < 0.01$). In an analysis of total effect upon usage, the endogenous variables that contributed most to usage were attitude toward computer use (total effect = 0.306), relative advantage (total effect = 0.167), ease of use (total effect = 0.114), and enjoyment (total effect = 0.040). The exogenous variables that contributed most to usage were compatibility (total effect = 0.475), user rating of system quality (total effect = 0.222), and training (total effect = 0.177). The only independent variables that exhibited a significant direct effect upon attitude were relative advantage ($\beta = 0.545$; $p < 0.01$), ease of use ($\beta = 0.345$; $p < 0.01$), and experience with similar programs ($\beta = 0.143$; $p < 0.01$). In an analysis of total effect, the variables that contributed most to attitude were relative advantage (total effect = 0.545), compatibility (total effect = 0.461), and end-user computing experience (total effect = 0.143). Aside from confirming some of the relationships proposed in the original TAM, this revised TAM confirmed the importance of compatibility as a predictor deserving of further investigation. In addition, the authors acknowledged the need for further investigation into other possible predictor variables, suggesting the possible value of investigating normative beliefs and subjective norms.

The most recently published study to examine the TAM was conducted by Venkatesh and Davis.[79] Their research model (TAM2) extended the original TAM to account for social influences and cognitive instrumental factors. Their aim was to identify key determinants of TAM's perceived usefulness and behavioral intention. Their study sample included employees (study groups) from four different firms facing the decision to adopt four different systems (a work scheduling application, a new mainframe operating system, an account management system, and a stock portfolio analysis application). In two cases, management mandated the use of the software innovation and in two cases use was voluntary, allowing the researchers to assess the effect of voluntariness upon decision to adopt. Respondents were surveyed at three separate time points, before implementation (T1), one-month after introduction of the innovation (T2), and three-months after introduction of the innovation (T3), to assess the effect of experience with the innovation on the influence of the variables of TAM2. The regression results for each model are displayed in Table 2.7. The model explained 34 to 52 percent of the variance of intention to use. Overall, the results indicate that the effect of subjective norm upon usage intention is dependent upon the context of the use situation. That is, the effect of subjective norm upon intent to use is moderated by user experience and voluntariness of the usage situation. When knowledge and beliefs about a system are

[79] Venkatesh V, Davis FD. A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science*. 2000;46:186-204.

ill-formed, for lack of direct experience with the system, potential adopters must rely heavily upon the beliefs and opinions of others in forming adoption intentions. However, during the implementation stage, as consumers learn, through direct experience, about the strengths and weaknesses of a system, the effect of subjective norm decreases. Likewise, subjective norm exerts a more powerful effect upon usage intentions when system use is mandatory. This seems intuitive, as the expectation would be that in situations where management explicitly mandates the use of a system, the effect of an important others—managers and superiors—would be primary determinants of system use. Since sample sizes were less than 50 for each of the four study groups, the researchers cautioned against overlooking the effects of those variables deemed insignificant, due to issues of inadequate power. Therefore, the importance of subjective norm in cases where adoption is voluntary should not be overlooked. The authors encouraged further work on the exploration of social influence using larger sample sizes.

Table 2.7. TAM2 Regression Results Explaining Intention to Use Software Innovation by Study Group

	Voluntary Settings				Mandatory Settings			
	Study 1 (n=38)		Study 2 (n=39)		Study 3 (n=43)		Study 4 (n=36)	
Time of Measurement	R^2	β	R^2	β	R^2	β	R^2	β
Pre-implementation (T1)	0.39		0.37		0.44		0.52	
Perceived Usefulness		0.58[c]		0.51[c]		0.48[c]		0.52[c]
Perceived Ease of Use		0.18a		0.27[b]		0.13[a]		0.18[a]
Subjective Norm		0.11		0.10		0.31[b]		0.28[b]
One Month[d] (T2)	0.44		0.34		0.47		0.42	
Perceived Usefulness		0.55[c]		0.50[c]		0.54[c]		0.44[c]
Perceived Ease of Use		0.17[a]		0.21[a]		0.15[a]		0.11[a]
Subjective Norm		0.06		0.08		0.26[b]		0.24[b]
Three Months[d] (T3)	0.42		0.42		0.39		0.39	
Perceived Usefulness		0.63[c]		0.64[c]		0.57[c]		0.50[c]
Perceived Ease of Use		0.14[a]		0.16[a]		0.17[a]		0.22[a]
Subjective Norm		0.11		0.02		0.10		0.08

a = $p < 0.05$
b = $p < 0.01$
c = $p < 0.001$
d = Represents time since introduction of the software innovation
Adapted from Venkatesh and Davis, 2000

2.1.1.3 Summary

The research in the area of perceived innovation characteristics indicate that behavioral intent, and to a lesser degree actual use is heavily dependent upon user perceptions of the innovation under study. The literature is rich with examples of models that use perceptual variables to predict behavioral intention or system adoption. An examination of literature from two similar perspectives (innovation characteristics and technology acceptance) reveals important parallels. Both models emphasize the importance of relative advantage and simplicity (sometimes measured as complexity) and to a lesser extent compatibility, perceived risk, and social norms. Researchers have also examined the effect of experience level and voluntariness upon adoption and concluded that these variables also may play a role in predicting innovation-adoption.

2.1.2 Consumer Innovativeness Perspective

Diffusion theorists have recognized that individuals do not adopt innovations instantaneously; rather, as an innovation achieves widespread adoption among members of a social system, certain types of individuals accept new technologies more rapidly than others.[80] When the number of new adopters adopting an innovation over time is plotted, the classic non-cumulative adoption curve is generated. The

[80] Rogers EM. *Diffusion of Innovations*. 4th ed. New York: The Free Press, 1995: 279.

non-cumulative adoption curve approaches a normal distribution.[81,82,83,84] Using the mean and standard deviation, this distribution can be partitioned into five different population groups or adopter categories.[85] Though this categorization scheme has become convention, it is important to note that innovativeness—the trait—is a continuous variable, and the classification of individual adopters into distinct categories based on their innovativeness is much like dividing the continuum of social status into different socioeconomic categories (e.g., upper class, middle class, lower class, etc.). As such, this partitioning represents an oversimplification that aids in the understanding of human behavior and the exploration of the generalizations characteristic to each group. These different adopter categories and an approximation of the percentage of adopters in each category are shown in Figure 2.3.

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[81] Ibid., 257.

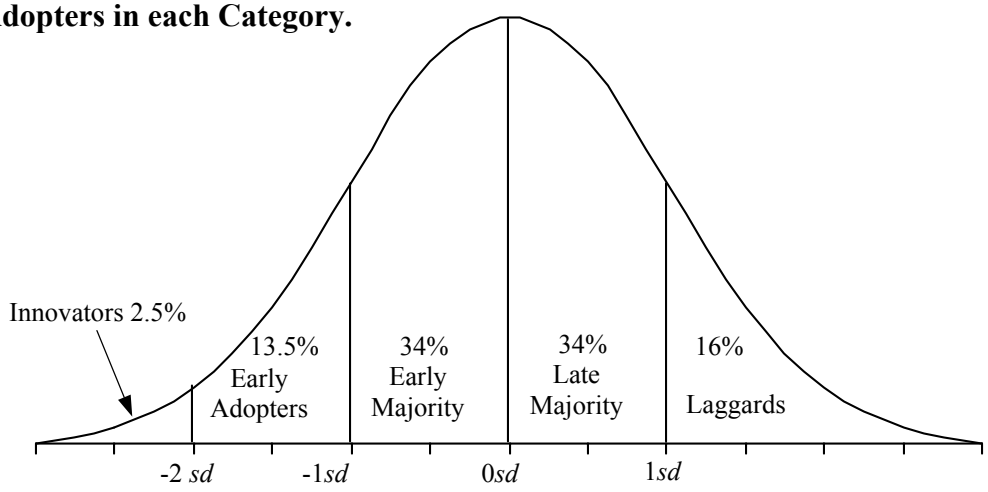
[82] Rogers EM. Categorizing the adopters of agricultural practices. *Rural Sociology.* 1958;23:346-3.

[83] Ryan B. A study in technological diffusion. *Rural Sociology*. 1948;13:273-285.

[84] Bose SP. The diffusion of a farm practice in Indian villages. *Rural Sociology*. 1964;29:53-66.

[85] Rogers EM. *Diffusion of Innovations*. 4th ed. New York: The Free Press, 1995: 262.

Figure 2.3. Non-Cumulative Adoption Curve and Approximate Percent of Adopters in each Category.



Adapted from Rogers, 1995

Table 2.8. Rogers's Generalizations Regarding Earlier Adopters

1.	Earlier adopters are not different from later adopters in age.
2.	Earlier adopters have more years of formal education than later adopters.
3.	Earlier adopters are more likely to be literate than later adopters.
4.	Earlier adopters have higher social status than later adopters.
5.	Earlier adopters have a greater degree of upward social mobility than later adopters.
6.	Earlier adopters have larger units (farms, schools, companies, and so on) than later adopters.

Adapted from Rogers, 1995

2.1.2.1 Review of Studies

One of the first marketing studies to examine the factors identifying innovative consumers was conducted by Boone.[86] Boone conducted a study of 52 consumers who were among the first purchasers of a new cable television service in Mississippi. When compared to consumer followers (later purchasers) of this technological innovation, consumer innovators were more likely to be married ($p < 0.05$) and employed in managerial or professional occupations ($p < 0.05$). In addition, consumer innovators reported a higher household income when compared to later purchasers with median incomes of $12,000 and $7,900, respectively ($p < 0.05$). Consumer innovators belonged to more social groups, such as civic clubs, professional organizations, and organized church groups, when compared to consumer followers. Innovators belonged to an average of 4.7 clubs with followers belonging to an average of 2.4 clubs ($p < 0.05$).

To explore the differences between innovative and late adopting consumers of innovative food products, Uhl, Andrus and Poulsen conducted a study of 541 households to evaluate the demographic and psychographic differences between these groups of consumers.[87] A univariate analysis of household variables revealed that

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[86] Boone LE. The search for the consumer innovator. *Journal of Business*. 1970;43:135-140.

[87] Uhl K, Andrus R, Poulsen L. How are laggards different? An empirical inquiry. *Journal of Marketing Research*. 1970;7:51-54.

innovative consumers were more likely to come from families with higher incomes (actual values or significance levels not reported). In addition, innovative food product consumers were more likely to be brand loyal when compared to late adopters (actual values or significance levels not reported). A stepwise discriminant function analysis was conducted using 11 demographic and psychographic variables. The variables that best discriminated between innovative buyers were family size, life cycle variable (a variable that combined age, marital status, and presence of children), age, and family income (standardized β weights not reported). Because of the lack of statistical significance of 7 of their 11 demographic variables, these authors concluded that there might not be many differences between innovative and laggard adopters of innovative food products.

In another study, Feldman and Armstrong examined the differences between early adopters and non-adopters and early adopters and late adopters of a major automotive innovation.[88] In the comparison of early adopters to late adopters, early adopters tended to be older ($p<0.05$) and have higher incomes ($p<0.01$). In the comparison of adopters and non-adopters, the adopters were older ($p<0.01$), less educated ($p<0.05$), and employed as craftsmen or foremen ($p < 0.001$). Though some of their results were consistent with the extant literature on consumer innovativeness,

[88] Feldman LP, Armstrong GM. Identifying buyers of a major automotive innovation. *Journal of Marketing*. 1975;39:47-53.

others were inconsistent with some of Rogers's generalizations. However, the researchers concluded that their findings suggested that demographic predictors of innovativeness are highly product specific. They give no further explanation for their results, and since the researchers fail to report any descriptive statistics, further interpretation of their findings is difficult.

In an effort to explore the differences between adopters and non-adopters of home computers, Dickerson and Gentry conducted a study to evaluate demographic, psychographic and experiential factors that discriminated between these groups of consumers.[89] The demographic predictors examined in this study included: age, home ownership, income level and education level. The resulting stepwise discriminant function retained all of the demographic variables and accounted for 13 percent of the variability. Based on the standardized regression weights associated with each variable, the most important predictors were home ownership ($\beta = 0.65$), followed by income ($\beta = 0.53$), education ($\beta = 0.39$), and age ($\beta = 0.39$). Supporting the authors' hypothesis that home computer adopters were more likely to be homeowners, have more formal education, and have higher incomes. In this study, home computer adopters were found to be older than non-adopters with 52 percent of

[89] Dickerson MD, Gentry JW. Characteristics of adopters and non-adopters of home computers. *Journal of Consumer Research*. 1983;10:225-235.

the adopters belonging to the 30-45 year old age group compared to only 40 percent of non-adopters belonging to this same age group.

In another study, Warren, Abercrombie and Berl examined the differences between adopters and non-adopters of an alternative long distance provider—a technological service innovation—to investigate possible demographic and psychographic differences between adopters and non-adopters.[90] There study was conducted on a sample of 465 adopters and 260 non-adopters of an innovative alternative long-distance telephone service. Using stepwise discriminant function analysis, they found that the most important discriminators for adoption of alternative long-distance telephone service were monthly long-distance telephone expenditures ($\beta = 0.83$), age ($\beta = -0.33$), education ($\beta = 0.27$), and dual income family ($\beta = 0.21$). These researchers concluded that the adopter of innovative alternative long-distance service had higher long-distance bills, was younger, had more formal education and was more likely to be from a dual income family.

In a study to investigate the adoption of consumer-related technologies in the elderly, Zeithaml and Gilly found that, when compared to the non-elderly, the elderly had adopted fewer consumer technologies.[91] When compared to consumers age 18 to

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[90] Warren WE, Abercrombie C, Berl RL. Characteristics of adopters and nonadopters of alternative residentail long-distance telephone services. *Advances in Consumer Research*. 1988;15:292-298.

[91] Zeithaml VA, Gilly MC. The elderly consumer and adoption of technologies. *Journal of Consumer Research.* 1985;12:353-357.

64, fewer consumers 65 years of age or older had adopted many electronic innovations. These included: scanner equipped grocery stores ($p < 0.01$), automated bank teller machines ($p < 0.0001$), call waiting ($p < 0.0001$) and call forwarding ($p < 0.0001$). However, more elderly consumers had adopted electronic funds transfer compared to non-elderly consumers ($p < 0.0001$). Researchers explained that one reason for this inconsistency with respect to the adoption of electronic funds transfer was that electronic funds transfer offered a considerable relative advantage over conventional deposits. This benefit in relative advantage was great enough in magnitude to overcome any deleterious effect that age may have had on the likelihood of adoption.

2.1.2.2 Summary

Though previously cited studies on innovation characteristics indicate that perceptual variables are more powerful direct predictors of adoption, the innovativeness literature suggests that some of these demographic variables aid in the prediction of which consumers are more likely to adopt innovative technologies earlier in their product life cycles. In addition, from a practical standpoint, study of the nature of the effect of demographic variables upon adoption can assist in the development of marketing strategies to target appropriate segments.

The findings in the diffusion literature regarding the characteristics of the innovative consumer are conflicting. This is particularly the case with the age variable. However, the conflicting findings regarding age may be attributable to the nature of the innovation under study. Nevertheless, the literature reviewed consistently shows that the consumer innovator tends to be more highly educated and has a higher household income than non-innovators.

2.2 In-home Shopping Perspective

Internet pharmacy service provides consumers with a purchasing mode that allows them to buy products from home. In essence, Internet pharmacies—and other consumer online marketplaces—are high-technology variants of more traditional in-home shopping modes, such as catalog and telephone shopping. All these forms of marketing fall under the classification of direct marketing. Direct marketing is defined as "an interaction system of marketing which uses one or more advertising media to affect a measurable response and/or transaction at any location."[92] Though the Internet has undeniably changed the direct marketing industry, there are many similarities between the way business is conducted over the Internet and traditional direct marketing means. For example, consumers must place orders without the benefit of physical inspection of products being purchased, there is a lack of face-to-

[92] Direct Marketing Association Inc. *1982 Fact Book on Direct Response Marketing*. New York: Direct Marketing Association, Inc. 1982: xxiii.

face interaction between seller and buyer, and there is a lag time between purchasing and delivery of the product. Due to these similarities, there is reason to believe that there may be parallels in consumer purchasing motives. In addition, an analysis of the literature on the in-home shopper may reveal valuable insight with regard to the types of consumers that may purchase products from Internet pharmacies.

2.2.1 Review of Studies

One of the first studies of in-home shopping consumers was conducted by Gillet.[93] Gillet proposed a profile of the urban in-home shopper as more affluent, better educated and more convenience oriented than the store shopper. Analyzing data from personal interviews of a semi-random sample of 210 female shoppers, Gillet found that in-home shoppers ranked significantly above other shoppers when compared on family income level, shopper education level, and occupation of head of household ($p = 0.05$). In addition, this study revealed a significant relationship between level of in-home spending and convenience orientation. Gillet concluded that not only were in-home shoppers younger, more affluent and better educated, but they were also more likely to perceive convenience as an important factor in the shopping mode decision.

[93] Gillet PL. A profile of urban in-home shoppers. *Journal of Marketing.* 1970;34:40-45.

Using a purposive sample of 249 "heavy in-store" and "heavy in-home" shoppers of cosmetic items, Peters and Ford[94] revealed a profile of the in-home door-to-door sales shopper that was almost the exact opposite of that proposed by Gillet. In this study, in-home shoppers, defined as users of door-to-door sales shopping, were depicted as less educated and less affluent than in-store shoppers. This study reported that women who are heavy in-home buyers of cosmetics from door-to-door salespeople have significantly less formal education than heavy in-store buyers with 26 percent of in-store buyers having college degrees or better compared with 10 percent of in-home buyers ($p < 0.01$). In addition, 68 percent of the in-home group had a household income below $15,000 compared to 55 percent of the in-store buyers ($p < 0.04$). Though there were considerable differences in these findings, when compared to the Gillet study, these differences may reflect the dissimilarities between door-to-door sales shoppers and shoppers who patronize other in-home shopping modes (i.e., telephone and catalog).

In another examination of in-home shoppers, Reynolds proposed a profile of the in-home shopper that characterized them as young, affluent, risk takers, motivated by a desire for convenient shopping.[95] In a randomized mail survey study of 302 female home-makers, Reynolds compared the differences in lifestyle and

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[94] Peters WH, Ford NM. A profile of urban in-home shoppers: The other half. *Journal of Marketing*. 1972;36:62-64.

[95] Reynolds FD. An analysis of catalog buying behavior. *Journal of Marketing.* 1974;38:47-51.

demographic characteristics between non-buyers, infrequent buyers and frequent buyers of products from catalogs. Catalog buyers belonged in younger age groups ($p < 0.10$), had more children under the age of 12 years ($p < 0.10$), and were more venturesome ($p < 0.10$) than non-buyers.

Because of concerns that the findings of the extant literature on in-home shopping, the majority of which was conducted in the early to mid-seventies, may not generalize to the more modern in-home shopping population, Lumpkin and Hawes conducted a mail survey study of 581 households in 1985 to determine how non-users, infrequent users and frequent users of catalog shopping differ along demographic and psychographic characteristics.[96] One of the major findings of this study was that a MANOVA analysis of demographic characteristics indicated that there were overall significant differences between non-users, infrequent users, and frequent users of catalog purchasing (F-ratio = 2.60; $p = 0.001$). A discriminant function analysis of the 13 different demographic characteristics revealed only eight that were statistically significant discriminators of catalog purchasing frequency. The demographic variables that discriminated between more frequent catalog shoppers included: being married, being female, having total family income of over $20,000, having a home, having more children, having a male head of household with a higher education level (measured as number of years of formal schooling), having a younger

[96] Lumpkin JR, Hawes JM. Retailing without stores: An examination of catalog shoppers. *Journal of Business Research*. 1985;13:139-151.

male head of household, and having an employed female head of household. These relationships are displayed in Table 2.9.

Table 2.9. Standardized Discriminant Function Coefficients for the Analysis of Demographic Variables that Explain High Frequency of Catalog Use

Demographics	F-Ratio	p-value	Standardized Regression Coefficient
Martial Status [a]	15.76	0.001	0.468
Sex [b]	5.69	0.004	0.406
Income [c]	11.74	0.001	0.296
Residence Type [d]	8.13	0.001	0.215
No. of Children	7.44	0.001	0.216
Education Level [e]	7.09	0.001	0.092
Age of male head of household	4.53	0.001	-0.028
Employment status of female[f]	4.03	0.011	0.086

[a] Where 0 = not married and 1 = married
[b] Where 0 = male and 1 = female
[c] Where 0 = less than $20,000 per year and 1 = greater than $20,000 per year
[d] Where 0 = does not own a home and 1 = does own a home
[e] Measured in years
[f] Where 0 = employed full-time and 1 = not employed full-time

Adapted from Lumpkin, 1985

To further explore the characteristics of purchasers and non-purchasers of products through direct selling in-home shopping methods, Peterson, Albaum, and Ridgeway conducted a mail survey study on a representative national random sample of 988 "middle class" consumers.[97] Direct selling was defined by these researchers as "personal contact between a salesperson and a consumer away from a fixed business location such as a retail store." A comparison of purchasers and non-purchasers of

[97] Peterson RA, Albaum G, Ridgway NM. Consumers who buy from direct sales companies. *Journal of Retailing*. 1989;65:273-286.

products via direct selling indicated that in-home purchasers were younger, possessed more formal education, and had higher household incomes than non-purchasers (Table 2.10). The five most commonly reported reasons for purchasing from a direct sales company included: convenience (55.7%), low price (35.5%), ability to examine products (43.8%), personal attention (45.9%), and atmosphere (10.6%).

Table 2.10. Demographic Characteristics of Direct Sales Purchasers and Non-Purchasers

Characteristic	Purchased in past 12 months (%)	Did not purchase in past 12 months (%)
Age[a]		
19-29	18.8	5.8
30-39	25.5	17.0
40-49	18.2	12.4
50-59	15.3	18.1
60 or older	22.2	46.7
Education[b]		
Non H.S. Graduate	19.6	30.9
H.S. Graduate	42.3	35.1
Some College	18.5	14.3
College Graduate	19.6	19.7
Household Income[b]		
Less than $10,000	15.4	19.3
$10,000-$19,999	24.3	29.8
$20,000-$29,999	21.8	15.4
$30,000-$39,999	16.7	22.6
$40,000-or more	12.8	12.9

[a] Univariate F-ratio significant at 0.001 level
[b] Univariate F-ratio significant at 0.05 level
Adapted from Peterson, 1989

One of the most recent studies that examined the characteristics of in-home shopper was conducted by Jasper and Lan.[98] In a mail survey study of 680 apparel catalog shoppers, Jasper and Lan found that, when compared to infrequent catalog

[98] Jasper CR, Lan P-NR. Apparel catalog patronage: Demographic, lifestyle and motivational factors. *Psychology & Marketing*. 1992;9:275-96.

shoppers, frequent catalog shoppers were more inactive, more likely to perceive convenience as an important factor in the decision to shop at home, better educated and older. Using hierarchical multiple regression analysis, the most influential predictors of catalog shopping were a convenience oriented lifestyle ($\beta = 0.506$; $p = 0.0001$), level of formal education achieved ($\beta = 0.288$; $p = 0.001$), age ($\beta = 0.261$; $p = 0.049$), number of sports activities ($\beta = -0.11$; $p = 0.096$) and number of inactive activities ($\beta = 0.116$; $p = 0.085$). A linear multiple regression function constructed using only these four predictor variables showed that these factors explained 9.86 percent of the variance in catalog shopping frequency.

In one of the few published reports on Internet in-home shoppers, Weber and Roehl outlined the demographic characteristics, Internet use behaviors, Internet shopping behaviors and attitudes of consumers who purchased travel service online.[99] These researchers found that web-users who purchased travel services online differed from those who did not with respect to age, formal education level and household income level. Respondents who were 25 years of age or under or over 55 years of age were less likely to purchase travel arrangements online than were people in the 26-55 year old age group. In addition, respondents with 4-year college degrees or postgraduate degrees were more likely to purchase travel online than were people at

[99] Webber K, Roehl WS. Profiling people searching for and purchasing travel products on the World Wide Web. *Journal of Travel Research*. 1999;37(3):291-298.

other education levels. Respondents with household incomes of $50,000 or above were more likely to purchase travel online than those below $50,000. Online travel purchasers were more likely to have been online for 4 or more years and spent more time online per week than those that did not purchase online. Eighty-percent or more of respondents who purchased travel online rated "security of sensitive information" (86.5%), "quality of information about purchase choices" (85.6%), and "Internet vendor's reliability" (84.0%) as very important features necessary for online travel vendors. The most frequently cited reasons for not purchasing online were concerns over "credit card security" (77.8%), "no assessment of product quality" (76.0%), "privacy issues" (57.7%), "rather purchase locally" (41.3%), and "unfamiliar vendors" (37.5%).

2.2.2 Summary

A review of the literature on in-home shoppers reveals some inconsistency regarding a profile of the in-home shopper. In general, there is some debate in the literature as to the effect of age on in-home shopping behavior, with three of the four studies reviewed reporting that younger age was associated with a higher use of in-home shopping modes. Most literature describes a profile of the average in-home shopper as having more formal education, higher family income, and higher occupational status than the store shopper (factors that parallel what is observed in the consumer innovativeness literature). This literature also reveals that convenience is a primary motive for in-home shopping. Literature on the nature of the online in-home

shopper reveals that there are consumer concerns regarding security of credit card information and privacy. These factors suggest that those consumers who avoid online shopping may do so out of concern regarding perceived financial and psychological risks of this shopping mode.

2.3 Perceived Risk Perspective

As previously cited studies have suggested, high levels of perceived risk in conducting business with Internet pharmacy websites may help to further explain why some patients may avoid using Internet pharmacy service. If the influence of these risk perceptions outweighs that of any perceived relative advantage this service may provide, patients may be more likely to avoid adoption. Perceived risk has been examined in studies of in-home shoppers. Intuitively, the results of these studies indicate that high levels of perceived risk are an important deterrent to in-home shopping; therefore, it is reasonable to expect that perceived risk would exert an equally important effect upon the purchase of prescription medications online.

Purchasing goods and services online exposes consumers to certain characteristic risks. The most well recognized risks include: financial risk and breach-of-privacy risk. In most cases, the online buying process involves submitting credit card information electronically. In the case of Internet pharmacy service, consumers are also required to submit confidential information about pre-existing disease states and medical conditions that become part of a pharmacy patient profile.

In each case, prospective pharmacy patrons must weigh the benefits of the service against the risk that sensitive financial or medical information may be compromised by "hackers" that may penetrate the security systems of the pharmacy website. These notions are reinforced by reports in the lay press regarding the fraudulent acquisition of credit card numbers by criminals and the sale of personal consumer information to marketing organizations by certain e-commerce websites.

2.3.1 Review of Studies

Bauer was one of the first researchers to explore the effect of risk on consumer purchase decisions.[51] He suggested that all consumer purchase decisions involve risk because each purchasing experience produces social and economic consequences that cannot be predicted with absolute certainty by the consumer.

A concept related to perceived risk is that of consumer trust. Trust is the belief that the explicit or implied promise of a retailer can be relied upon and the retailer will not take advantage of the vulnerability of the consumer.[100] It is recognized as a necessary prerequisite for order placement. In this sense it has been referred to as an *order qualifier*.[101] Specifically, before a consumer can place an

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[100] Geyskens I, Steenkamp EM, Scheer EM, Kumar N. The effects of trust and interdependence on relationship commitment: A trans-atlantic study. *International Journal of Research in Marketing*.1996;13:303-317.

[101] Doney PM, Cannon JP. An examination of the nature of trust in buiyer-seller relationships. *Journal of Marketing*.1997;61:35-51.

order with a retailer, he or she must first have trust in the online retailer. Trust and perceived risk have been shown to have a direct negative association. That is, low levels of consumer trust in retailers resulting in high levels of perceived risk.[102]

Since purchasing goods online exposes consumers to a certain degree of risk, there is strong reason to believe that risk perceptions will affect attitude and intent toward shopping for medications online. Jacoby and Kaplan identified five different components of perceived risk.[103] These five categories of risk include: 1) financial risk; 2) performance risk; 3) physical risk; 4) psychological risk; and 5) social risk. To this list of categories, Peter and Tarpley later added a sixth component, time loss.[104]

Empirical studies of in-home shoppers have shown that perceived level of risk exerts a negative influence on a consumer's decision to purchase products from home. In a study conducted to determine telephone shoppers from non-telephone shoppers and examine risk perceptions of these consumers, Cox and Rich found that perceived level of risk was the most powerful predictor separating the in-home from

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[102] Jarvenpaa SL, Tractinsky N, Saarinen L. Consumer trust in an Internet store: a cross-cultural validation. *Journal of Computer-Mediated Communication*.1999;5:1-35.

[103] Jacoby J, Kaplan LB. *The Components of Perceived Risk: Paper 18*. West Lafeyette: Purdue University, 1972: 2.

[104] Peter PJ, Tarpley LX. A comparative analysis of 3 consumer decision strategies. *Journal of Consumer Research*. 1975;2:29-35.

store shoppers.[105] Nearly two-thirds of non-phone shoppers avoided in-home shopping by telephone due to the high levels of perceived risk associated with this purchase mode.

To further investigate the issue of perceived risk as a deterrent to in-home shopping, Spence, Engel and Blackwell conducted a study of 300 consumers to examine the level of perceived risk involved in the purchase of 20 consumer goods by mail-order or through a store or salesperson.[106] Their results indicated that consumers perceived higher levels of risk in purchasing through the mail ($p < 0.001$). These researchers also found that there was a significant inverse relationship between level of perceived risk and both income and formal education, with respondents with higher levels of income and higher levels of formal education reporting lower levels of risk perceived in buying through mail ($p \leq 0.05$).

In a study of purchasers and non-purchasers of products through direct selling methods, Peterson, Albaum and Ridgway investigated the level of perceived risk involved in the purchase of products through five alternative buying modes: retail store, mail-order catalog, direct selling sales party, direct selling in their home, and unsolicited telephone call.[107] In this study, researchers did not partition risk into its

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[105] Cox DF, Rich SU. Perceived risk and consumer decision making--the case of telephone shopping. *Journal of Marketing Research*. 1964;1:32-39.

[106] Spence HE, Engel JF, Blackwell RD. Perceived risk in mail-order and retail store buying. *Journal of Marketing Research*. 1970;7:364-369.

[107] Peterson RA, Albaum G, Ridgway NM. Consumers who buy from direct sales companies. *Journal of Retailing*. 1989;65:273-286.

different components. Perceived risk was measured using a risk perception index, which served as an estimate of overall perceived risk. An analysis of the mean risk perception scores for each shopping mode revealed that mail order catalog shopping was perceived as more risky than retail store shipping (32 versus 13, respectively). In addition, risk perception index values were significantly higher for mail order catalog non-purchasers when compared to purchasers (41 versus 30; $p < 0.01$).

In one of the only studies of its kind, Gerthoffer examined consumer perceptions of risks about using mail service and retail pharmacies.[108] Drawing upon the work of Jacoby and Kaplan and Peter and Tarpley, Gerthoffer's instrument measured six dimensions of perceived risk (financial, performance, physical, psychological, social, and time loss).[109,110] In an analysis of 737 employees of the University of Texas, Gerthoffer found that, when compared to users of mail-service pharmacy, retail pharmacy patrons perceived a greater degree of risk along each of the six risk dimensions studied (Table 2.11). In addition, the overall perceived risk of using mail-service pharmacy was significantly higher in retail pharmacy patrons

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[108] Gerthoffer T. *An Analysis of Consumer's Perceptions of Risk Associated With Using Mail-order and Local Retail Pharmacies*. Doctoral Dissertation. Austin: University of Texas, 1993.

[109] J, Kaplan LB. *The Components of Perceived Risk: Paper 18*. West Lafeyette, Purdue University; 1972: 2.

[110] Peter PJ, Tarpley LX. A comparative analysis of 3 consumer decision strategies. *Journal of Consumer Research*. 1975;2:29-35.

when compared to mail-service patrons, 103.35 versus 74.09, respectively ($p < 0.001$).

Table 2.11. Comparison of Local Retail Versus Mail-Service Pharmacy Users Mean Risk Rating Scores for Likelihood of Risk Occurrence With Mail-Service Pharmacy Use.

	Mean Scores[a]		
Risk Factor	**User (n = 219)**	**Non-User (n = 453)**	**F-value**
Financial	1.90	3.10	58.5***
Time	4.67	5.82	48.7***
Social	1.40	1.84	13.0***
Psychological	1.47	1.95	14.0***
Performance	2.01	3.02	35.6***
Physical	2.25	3.11	22.8***

[a] Seven-point scale used to Measure Risk Perception with Anchor Points: 1 = very unlikely, 7 = very likely
*** F-test significant ($p<0.001$)

Adapted from Gerthoffer, 1993

In a study similar to that of Gerthoffer, Carroll and Fincham compared differences in risk perception between elderly (over 55 years of age) mail service pharmacy and community pharmacy patrons.[111] Using a risk perception model similar to that employed by Gerthoffer, Carroll and Fincham partitioned risk into five dimensions (financial, convenience, social, psychological, and performance). Results

[111] Carroll NV, Fincham JE. Elderly consumers' perceptions of the risks of using mail-order pharmacies. *Journal of Social and Administrative Pharmacy*. 1993;10:123-9.

of ANOVA tests comparing the mean risk likelihood scores across community and mail service pharmacy users indicated that community pharmacy users perceived greater likelihood of risk for each item except for one of the social risk items (Table 2.12). In the case of this item (not knowing the pharmacist who fills my prescription), both community and mail service pharmacy users reported high mean risk perception scores (3.87 versus 3.74 for community and mail-service pharmacy users, respectively).

Table 2.12. Comparison of Community Versus Mail-Service Pharmacy Users Mean Likelihood of Risk Occurrence When Using Mail-Service Pharmacy

	Community Pharmacy Users		Mail-Service Pharmacy Users		
Variables	**Mean[a]**	**SD**	**Mean[a]**	**SD**	**F**
Financial Risk					
Paying more for my prescriptions	2.50	1.37	1.21	0.53	32.6***
Convenience Risk					
Spending a great deal of time filling out order forms	3.37	1.40	1.55	0.80	60.5***
Social Risk					
Not knowing the pharmacist who fills my prescription	3.87	1.50	3.74	1.50	0.2
Having no one to ask questions about my prescription	3.83	1.52	2.72	1.57	15.7***
Psychological Risk					
Worry about running out of my medicine before my order comes	3.63	1.43	2.33	1.36	28.8***
Worry about getting the wrong medicine	3.02	1.51	1.59	1.02	29.8***
Performance Risk					
Being given the wrong medicine	2.71	1.51	1.51	0.85	22.8***
Actually running out of medicine before my order comes	3.57	1.44	2.11	1.25	33.1***

[a] Five-point Likert scale used to measure likelihood of risk

*** = $p < 0.0001$

Adapted from Carroll and Fincham, 1993

In a study of 1,002 computer users age 45 or older, researchers investigated the readiness of these consumers to conduct business online.[112] The results of this study suggest that computer users in this age group are concerned about online privacy and the ability to conduct financial transactions online. Of the 1,002 respondents surveyed, 39 percent reported that they were "not confident" in conducting personal financial transactions online, such as online shopping, while only 32 percent were "very confident" in their ability to conduct these kinds of transactions. In addition, of the 437 (43.6%) respondents who had made online purchases, 74 percent were concerned about the privacy of Internet purchases, and 77 percent were concerned about the unauthorized tracking of Internet activities.

2.3.2 Summary

In general, the research on in-home shopping and risk perceptions shows that consumers perceive that in-home shopping modes are associated with greater degrees of risk than store shopping modes. Also, there is evidence that higher formal education and higher income have an inverse relationship with in-home shopping risk perception. In the case of Internet pharmacy adoption, there is reason to believe that confidence in financial transactions and breech-of-privacy may contribute to the perception of risk. Though few of these studies specifically addressed perceived risk

[112] AARP. *AARP National Survey on Consumer Preparedness and E-Commerce: A survey of computer usage age 45 and older*. Washington: AARP, 2000.

associated with in-home shopping for prescription medications, some researchers suggest that the level of risk perception is greater when considering products that require a high degree of importance to the consumer, with highest risk purchases being those involving personalized items, such as expensive products, and highly personalized products.[113] Following logically from this line of thought, considering both the cost and importance of prescription medications, prescription medication purchasing may engender a high degree of consumer involvement and therefore trigger significant risk consideration.

2.4 Pharmacy Patronage Perspective

The pharmacy patronage literature provides valuable insight into the motivating factors that determine a consumer's choice of pharmacy mode. Though there is very limited literature to date regarding Internet pharmacy service patronage, there have been a number of studies conducted to examine mail service pharmacy patronage and motivational factors. From a patient's perspective, there are many parallels between the Internet pharmacy service model and the mail service pharmacy model. Both offer many of the same benefits and suffer from similar disadvantages. Both kinds of pharmacies have been recognized for their cost savings, both deliver their products directly to the consumer through the mail, and both perform

[113] Gillet PL. In-home shoppers-an overview. *Journal of Marketing*. 1976;40:81-88.

pharmaceutical care services with little or no face-to-face patient interaction. Therefore, it may be that many of the same pharmacy patronage motives that encourage mail service pharmacy utilization mirror those that promote Internet pharmacy service utilization. Therefore, it may be of value to examine the literature on mail service pharmacy patronage motives. A review of this literature revealed only a handful of empirical studies on consumer perceptions of mail service pharmacy and pharmacy patronage behaviors. Though the conclusions of these studies will not directly apply to consumer perceptions and adoption of Internet pharmacy service, the results of these studies may provide valuable insight that might apply to the Internet pharmacy acceptance model.

2.4.1 Review of Studies

One of the first studies to explore mail service pharmacy patronage was conducted by Roberts and Fitzgerald.[114] To explore mail pharmacy patronage, Roberts and Fitzgerald conducted a telephone survey of 300 residences in an area where a major employer had begun to offer a mail order service prescription program. Among the users of the mail service pharmacy option, price was ranked as the major reason for using mail service with employer encouragement ranked as the second

[114] Roberts KB, Fitzgerald WL. Evaluation of consumer opinions of prescription drug services from community and mail-order phamracies. *Tennessee Pharmacist*. 1986;22:14-25.

most important reason. In addition, overall satisfaction was rated as good or excellent by 100 percent of the mail service pharmacy users surveyed.

Another study conducted by Smith and Coons examined the frequency of changing prescription purchase mode (community, mail service, independent, etc.) and the reasons for changing modes.[115] The different prescription purchase modes evaluated in this analysis included: independent pharmacy, chain pharmacy, discount pharmacy, supermarket pharmacy, clinic pharmacy, mail service pharmacy, and doctor's office dispensing. This mail survey study included survey data from 1,403 respondents. Of the 1,248 respondents who had purchased a prescription in the past six months, 596 (48%) of respondents reported that they had not changed prescription purchase source. For those patients who reported switching prescription service mode, the present prescription mode and the former prescription mode utilized and the net change in mode by source is displayed in Table 2.13. Only three sources demonstrated a net positive change in patronage, meaning that the patient base was increasing or more patients switched to than switched away from that mode. These were chain, with a five percent growth in patient base, supermarket, with a 132 percent increase in patient base, and mail service with a 150 percent increase in patient base. The most cited reason for changing prescription service mode was convenience (30%). This was followed closely by price (28%), relocation (15%) and

[115] Smith HA, Coons SJ. Changing source of prescription purchases: a patronage loyalty study. *Journal of Pharmaceutical Marketing & Management*. 1990;4:59-74.

insurance program change (14%). Surprisingly, customer service related reasons for switching were rarely cited, with only two percent of patrons reporting either poor professional service and long waiting time as reasons for changing prescription mode. An analysis of the 15 patients who utilized mail service pharmacy revealed that seven (46.7%) patients switched to mail service because they believed it was less expensive than their prior prescription mode, seven (46.7%) patients switched because of a change in insurance plan, and the remaining one (6%) patient switched due to other reasons. For the six patients who switched away from mail service, the reported reasons for doing so were convenience in two (33%) patients, price in two (33%) patients, insurance plan in one (17%) patient, and other reasons were cited in one (17%) patient. Though this study uncovers some important mail service pharmacy patronage motives, these results may be unstable due to an insufficient sample size of mail service patients.

Table 2.13. Net Changes in Source of Prescription Medications by Source

	Change		
Source	**Present (n)**	**Former (n)**	**Net Change (%)**
Independent	184	251	-67 (-27)
Chain	251	239	12 (+5)
Discount	58	63	-5 (-8)
Super Market	95	41	54 (+132)
Clinic	26	26	0 (0)
Mail service	15	6	9 (+150)
MD Office	9	12	-3 (-25)

Adapted from Smith and Coons, 1990

To compare any differences in patronage motives for elderly mail service or community pharmacy customers, Caroll and Finchman conducted a mail survey of 291 elderly (over 55 years of age) mail service and community pharmacy patrons.[116] In this study, only 13.7 percent of the respondents obtained most of their prescription medications from a mail service pharmacy with 81.4 percent obtaining most of their medications from a community pharmacy. A greater proportion of mail service patrons were male (74.4% versus 56.3%; $p<0.05$), married (86.6% versus 63.3%; $p<0.05$), and had third party coverage for prescription medications (69.2% versus 37.5%; $p<0.05$). There were no significant differences between mail service and community pharmacy patrons with respect to self-rated general health status or mobility measures. A higher proportion of mail service pharmacy patrons suffered from chronic diseases such as arthritis (74.3% versus 52.8%; $p<0.05$), heart problems (48.7% versus 31.0%; $p<0.05$), and stomach disorders (38.5% versus 23.1%; $p<0.05$). In addition, patients who utilized mail service pharmacies tended to use more physicians than community pharmacy patrons (2.10 ± 1.02 versus 1.65 ± 0.83; $p<0.05$). The highest ranked most important patronage motives for mail service pharmacy patrons were low prices (92.3%) with the remainder (7.7%) of the

[116] Carrol NV, Fincham JE. Elderly consumer's views of mail-order pharmacies. *Journal of Pharmaceutical Marketing & Management*. 1992;6:3-20.

respondents reporting convenience. Generally, respondents in both groups reported a low occurrence of problems with their respective pharmacy modes. However, patients in the mail service group reported a slightly higher occurrence of spending a great deal of time filling out forms (1.55 ± 7.2 versus 1.12 ± 0.42; $p<0.05$) and having a question about their drugs with no one to ask (1.61 ± 0.99 versus 1.26 ± 0.64; $p<0.05$).

Some interesting trends in pharmacy patronage motives are revealed in a study conducted by OrthoBiotech, Inc. This study included a sample of community pharmacy, mail service pharmacy and independent pharmacy patrons.[117] The study found that the most important motivators cited by consumers for pharmacy patronage included insurance coverage, convenience, service and value. In addition to surveying traditional brick-and-mortar patrons, this study gathered data on the patronage motives and opinions of mail pharmacy service and Internet pharmacy service patrons as well. Mail pharmacy patrons cited that price or co-payment amount was the most influential motivator for consumers who choose mail service pharmacy. Though less than one percent of households studied had used an online pharmacy to fill prescriptions in the 12 months preceding the survey, convenience was listed as the number one reason for Internet service pharmacy patronage. In

[117] Anon. Independents tops in consumer survey. *America's Pharmacist*. 2000. October:69-70.

addition, 64 percent of those surveyed reported that they were highly satisfied with their Internet pharmacy service experience.

Another study conducted by Insight Express, an online market research corporation, cast doubt on the viability of the Internet pharmacy service business model.[118] The results of this report suggested that, although the online pharmacy concept makes sense, it is failing to gain traction in the marketplace mainly because pharmacy consumers desire the face-to-face personal interaction with their local pharmacist. In an online convenience sample of 300 consumers, only 24 percent had ever visited an online pharmacy website, only seven percent had ever purchased products from an online pharmacy and 57 percent of respondents reported that they had no desire to purchase prescriptions from an online pharmacy website. The reasons for not purchasing prescriptions from an online pharmacy are listed in Table 2.14.

[118] Anon. Online Drugstores a Prescription for Failure, According to InsightExpress. 2000. Web Page. URL: http://www.insightexpress.com/news/release_102000.htm. 11 November 2000.

Table 2.14. Reasons Listed by Consumers for Not Using the Internet to Purchase Prescription Medications

Reason	% Respondents*
More comfortable with local pharmacist	60
Privacy Issues (about ordering online)	23
Insurance not accepted	8
Doctor could not fill order online	5
More expensive online	4

* Out of 300 consumers surveyed, actual n not reported by investigators
Adapted from InsightExpress, 2000

In an online survey of a weighted sample of 2,500 consumers, representative of the Internet user population according to age, gender and geographic location, Greenfield Online examined motivators and barriers to the utilization of Internet pharmacy service.[119] This study reported one of the highest published proportions of consumers who have purchased prescription drugs online, with 11.8 percent of consumers surveyed reporting the purchase of prescription drugs online. The most popular reasons cited for buying products online according to rank were: 1) saves time; 2) low price; 3) home delivery; and 4) avoid crowds. Consumers also cited the Internet as the most frequently used source for answers to medical questions with the respondent's own physician ranking second and brick-and-mortar pharmacies appearing as the least cited source.

[119] Greenfield Online, Inc. Online Drugstores Are Hurt by Not Having a Doctor in. 2000. Web Page. URL: http://www.Greenfield.com/pages/go_article.asp&aid=1333. 21 July 2000.

To investigate user perceptions and identify trends in Internet pharmacy acceptance, Schering Laboratories conducted a study of 1,000 members of the general public and medical and pharmacy fields.[120] This study suggested that education and income were the most important factors in identifying Internet users. Only 41 percent of respondents reporting Internet access possessed a high school diploma or less, while 70 percent of respondents with Internet access reported at least some college education. In addition, while less than 45 percent of respondents with Internet access reported households incomes of less than $30,000, 76 percent of respondents with Internet access reported household incomes of more than $50,000. Those consumers who had purchased prescription products from an online pharmacy generally found the experience to be convenient and safe. Seventy-one percent of these consumers rated the level of convenience associated with online pharmacy ordering as either very good or excellent. In addition, 54 percent rated speed of delivery and 61 percent rated privacy as either very good or excellent. Other characteristics rated as either very good or excellent by at least 50 percent of these consumers included: ease of ordering refills (67%), clear instruction on medication use (64%), and 24-hour availability (57%). The perceptions of Internet pharmacy non-adopters with regard to many of these factors may reveal possible perceptual barriers to acceptance. For example, only 27 percent of non-users perceived speed of delivery to be very good or

[120] Schering Laboratories. *Pharmacy.Com: A Virtual Reality*. Kenilworth: Schering Laboratories, Inc. 2000.

excellent, and 28 percent perceived privacy to be very good or excellent. Reimbursement, a factor that has a direct bearing on prescription drug cost, was one of the lowest rated perceptual variables by non-users with only 26 percent rating this factor as good or excellent.

2.4.2 Summary

A review of the mail service and Internet pharmacy service patronage literature provides insight as to some of the factors that consumers consider when making the decision to choose a pharmacy for prescription filling. In general, patients who patronize mail service and Internet pharmacies report low price, convenience and insurance coverage as important motives. Other important patronage motives identified in the literature include service and value.

2.5 Relationship Between These Perspectives and This Research

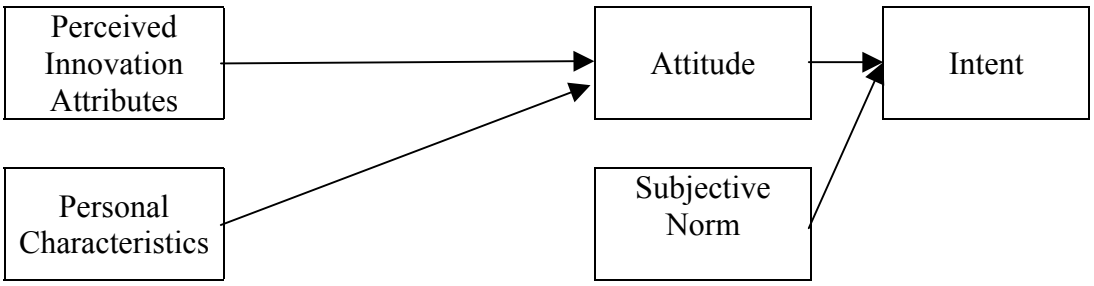
Research in diffusion of innovations, in-home shopping, risk perception, and pharmacy patronage have furthered our understanding of consumer evaluation and adoption of new products, predictors for in-home shopping, shopping risk evaluation, and motivators for pharmacy patronage. These streams of research shall be integrated to form a research model that will be used to examine the intent to use an Internet pharmacy service provider for prescription filling. Using these diverse streams of

research to formulate such a model is intuitively agreeable, considering the nature of the innovation under study. That is, Internet pharmacy service combines prescription medication and pharmaceutical care service (pharmacy patronage) with a technological information systems innovation (adoption of innovations) accessible from a patient's home computer (in-home shopping). In Chapter 3, the proposed base research model will be presented and key variables and their relationships will be described.

CHAPTER 3: THEORETICAL FRAMEWORK AND HYPOTHESES

This chapter builds upon the literature review and provides an in-depth discussion regarding the development of the theoretical model used in this study. The proposed base theoretical model is presented in Figure 3.1. This Chapter is organized into two sections. The first section is devoted to an explanation of the pertinent variables that may help explain the intention to adopt Internet pharmacy service. This is accomplished by evaluating factors elucidated by previous theoretical and empirical work. The second section of this chapter is devoted to incorporating these factors into a diffusion of innovations research model. This chapter concludes with a list of hypotheses proposed by this model.

Figure 3.1. Proposed Base Research Model



3.1 Key Model Variables

As discussed previously, Internet pharmacy service represents more than just one single innovation and is best described as an amalgam of many technological innovations. It is, simultaneously, a high-technology service innovation, a pharmacy service mode and a direct shopping method. Therefore, a search for key model variables must begin with an analysis of studies conducted in these fields. This section will present some of these variables and justify their importance by referring to previously cited research.

3.1.1 Personal Characteristics

According to the adoption of innovations literature, personal characteristics help to explain a small portion of the unique variance in adoption over that explained by perceptual variables. Studies on consumer innovativeness and in-home shopping behaviors indicate that personal characteristics aid in the prediction of both innovative product adoption and in-home shopping. In general, the literature on innovativeness indicates that consumers who possess more formal education and higher household incomes are more likely to be early adopters of innovative products, and the in-home shopping literature indicates that consumers who have more formal education, higher household incomes and higher occupational status are more likely to utilize in-home shopping methods. Since the evidence from these two lines of study seem to agree with regard to the effect of formal education and total household

income, these personal characteristics will be included in the proposed research model.

3.1.2 Perceived Innovation Characteristics

The diffusion of innovations literature has shown that innovation characteristics are a primary determinant of intent to adopt and actual use of innovative technological computer applications. Many of the previously cited models used in empirical research have focused on the five Rogersian attributes and perceived risk as primary predictors of adoption.[121,122,123,124] However, the previously cited empirical research suggests that the effect of observability and trialability on adoption appear to be weak.[125] This finding is confirmed by the results of the previously cited meta-analysis conducted by Tornatzky and Klien in which the only Rogersian attributes significantly correlated with adopting were relative advantage,

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[121] Rogers EM. Diffusion of Innovations. fourth ed. New York: The Free Press, 1995: 207.

[122] Labay DG, Kinnear TC. Exploring the consumer decision process in the adoption of solar energy systems. *Journal of Consumer Research.* 1981;8:271-278.

[123] Holak SL. Determinants of innovative durables adoption: An empirical study with implications for early product screening. *Journal of Product Innovation Management.* 1988;5:50-69.

[124] Holak SL, Lehmann DR. Purchase intentions and the dimensions of innovation: An exploratory model. *Journal of Product Innovation Management*. 1990;7:59-73.

[125] Tornatzky LG, Klein KJ. Innovation characteristics and innovation adoption-implementation: A meta-analysis of findings. *IEEE Transactions on Engineering Management*. 1982;29:28-45.

compatibility and complexity. The effect of perceived risk has been confirmed by a number of adoption models. In addition, previously cited studies in mail service pharmacy patronage indicate that the perception of financial, convenience, psychological, and physical risk may be important variables in the prediction of mail service pharmacy patronage. The goal of an explanatory model is to simplify reality by identifying a parsimonious set of predictor variables to explain as much variation in the dependent variable of interest as possible. Therefore, only the three Rogersian attributes identified by the Tornatzky and Klien meta-analysis and risk will be included in the proposed research model.

3.1.3 Attitude

Attitude is defined by Fishbein and Ajzen as "a learned predisposition to respond in a consistently favorable or unfavorable manner with respect to a given object."[126] Traditionally, an individual's attitude towards an object has been used as a common predictor of behavioral intention. The theory of reasoned action specifies a mathematical relationship between attitude, subjective norm and behavioral intent. According to this theory, most human behaviors can be predicted by a person's attitude and subjective norm towards the attitude object, with the predictive ability greatly influenced by the degree to which these items correspond with regard to the

[126] Fishbein M, Ajzen I. *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Reading: Addison-Wesley, 1975: 6.

elements of action, target, context and time. More specifically, this theory posits that all beliefs, if they are to influence behavior, exert their effect only through their impact on attitudes and subjective norms toward the particular behavior of interest. Though the importance of attitude as a powerful predictor of intent has not been undisputedly supported in the innovation adoption models cited previously, in most studies that included this construct, its effect on intent to adopt or usage has been significant. In four out of five of the previously cited studies that included this construct, its effect upon intent to adopt and usage has been significant and positive. Rather than omit this construct based upon the results of one study that failed to support its significance, this construct will be included in this model with the understanding that an alternative model, with attitude removed, can be tested to evaluate the importance of this construct.

3.1.4 Subjective Norm

Subjective norm (SN) is defined by Fishbein and Ajzen as a "person's perception that most people who are important to him think he should or should not perform the behavior in question."[127] SN is another construct that is derived from the theory of reasoned action. As mentioned above, this theory specifies the relationship that SN exhibits upon behavioral intent. The effect of subjective norm upon the

[127] Ibid., 302.

adoption of technological innovations has been largely neglected, and the models that have included this construct report conflicting results as to its importance in predicting intent to adopt or usage. Only three studies included SN as an independent variable influencing behavioral intent. Out of these three studies, SN exerted a significant effect upon intent in a majority of the cases (two of the three studies). Some of the studies also suggest that the effect of SN upon behavioral intent may be mediated by experience and voluntariness. SN exerts a more profound effect in cases where the adoption is mandated by supervisors or users have less experience with the innovation under investigation. Because SN has been shown in a majority of cases to assist in the prediction of behavioral intent, as with attitude, rather than omit this construct based on its inconsistent performance in similar models, it will be included and its effect on behavioral intent analyzed.

3.1.5 Behavioral Intent

The concept of behavioral intention has been of great value in the study of human behaviors. It has been recognized that "most behaviors can be accurately predicted from an appropriate measure of the individuals intention to perform the behavior in question."[128] Behavioral intent has been utilized extensively in the marketing and information technology literature as a proxy measure for actual use.

[128] Ibid., 380.

Many studies have established the correlation between behavioral intent and actual behavior. In the case of the research model proposed in this study, the item shall focus on the intent to use an Internet pharmacy service provider within the next year to have a prescription medication order filled. In a meta-analysis of 87 studies utilizing the theory of reasoned action, Sheppard, Hartwick and Warshaw found that the 95 percent confidence limits of the relationship between behavioral intent and actual behavior was 0.15 and 0.92.[129] Predictive correlations between intent and actual behavior obtained in the information systems literature have varied widely, from –0.23 to 0.79 with values typically within the range of 0.20 to 0.30.[130] In one of the previously cited studies investigating the utility of the TAM, Davis, Bagozzi and Warshaw found an intent to system usage link of 0.35.[131]

3.2 Specification of the Research Model

The model contains two manifest exogenous predictor variables (simplicity and compatibility), five observed exogenous predictor variables (relative advantage, perceived risk, total family income, level of education, subjective norm), one

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[129] Sheppard BH, Hartwick J, Warshaw PR. The theory of reasoned action: A meta-analysis of past research with recommendations for Modifications and future research. *Journal of Consumer Research*. 1988;15:325-343.

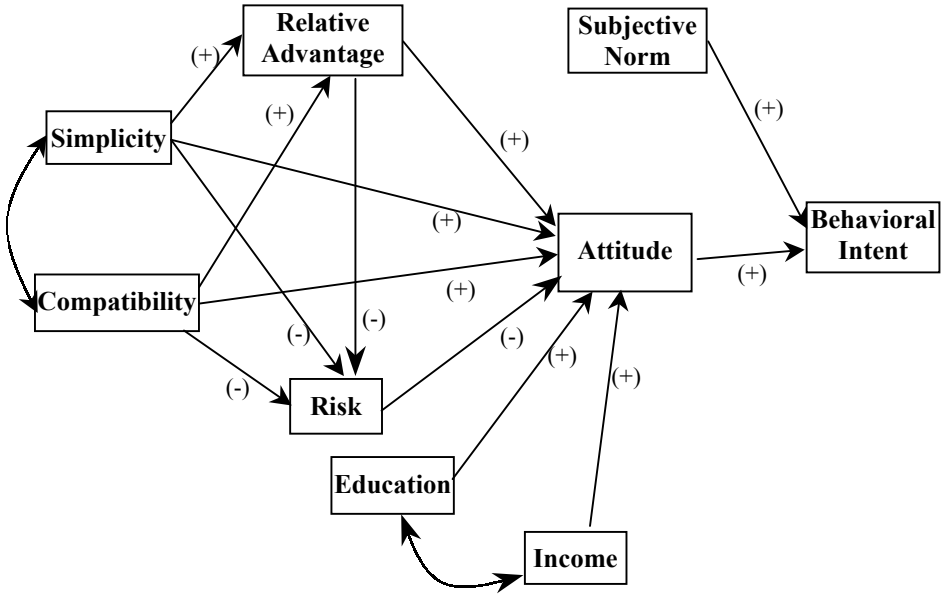
[130] Robey D. User attitudes and management information system use. *Academy of Management Journal*. 1979;22:527-538.

[131] Davis FD, Bagozzi RP, Warshaw PR: User acceptance of computer technology:A comparison of two theoretical models. *Management Science*. 1989;35:982-1003.

observed endogenous variable (attitude), and one observed criterion variable (behavioral intent). The path diagram for the research model proposed in this study is displayed in Figure 3.2. The implied variance-covariance matrix equations used by EQS to produce estimates of model parameters and the EQS model equations used for program input are displayed in Appendix 2.

Though this model is based upon previous empirical and theoretical research in the aforementioned fields of study, it draws heavily upon Holak's model of consumer durables adoption and Davis's TAM. The various constructs and relationships that comprise Holak's model are based upon theoretical and empirical innovation characteristics research and were described previously. This model expands upon Holak's original work by adding four independent variables (attitude, subjective norm, total family income, and education level).

Figure 3.2. Proposed Research Model



3.3 Statement of Hypotheses

This section describes the hypotheses of this research. As stated previously, many of these hypotheses draw heavily upon previous studies conducted by both Holak and others. These hypotheses are displayed structurally in Figure 3.2. Generally, the model hypothesizes that intention to adopt Internet pharmacy service is immediately determined by a consumer's attitude and subjective norm towards using Internet pharmacy service. Attitude, in turn, is immediately dependent upon a patient's education level, total family income, and perceptions of the relative advantage, simplicity, compatibility and risk of Internet pharmacy use. These perceptions exert effects on each other with relative advantage exerting a negative effect on perceived risk, simplicity exerting a negative effect on perceived risk and a positive effect on relative advantage, and compatibility exerting a positive effect on relative advantage and a negative effect on perceived risk. In addition to the direct and indirect effects outlined above, the model hypothesizes a correlation between both simplicity and compatibility and education level and total family income.

3.3.1 Attitude

According to the TRA and other innovation models, attitude has been shown to be an important predictor of behavioral intent. Accordingly, attitude towards Internet pharmacy service should exhibit a direct positive effect upon intent to adopt Internet pharmacy service.

H1: A more favorable attitude towards Internet pharmacy service has a significant positive effect upon intent to adopt Internet pharmacy service.

3.3.2 Subjective Norm

Previously published innovation models have demonstrated the significant impact of subjective norm upon adoption. There is reason to believe that this effect is more profound in situations involving innovations with which potential adopters have little prior experience. Due to the expected low rates of adoption of Internet pharmacy service, and the relative "newness" of the innovation, the effect of subjective norm should be taken into consideration. Consequently, the subjective norm towards Internet pharmacy service should exhibit a direct positive effect upon intent to adopt Internet pharmacy service.

H2: A more favorable subjective norm towards Internet pharmacy service has a significant positive effect upon intent to adopt Internet pharmacy service.

3.3.3 Perceived Innovation Attributes

Previous research has supported the importance of perceived innovation attributes as predictors of innovation-adoption. In addition, there is evidence that the list of important innovation attributes can be reduced to include: relative advantage,

simplicity, compatibility and risk. The effects of these perceptual variables are hypothesized to operate indirectly upon intent through their direct influence upon attitude toward Internet pharmacy. The hypotheses with regard to these perceived innovation attributes are as follows:

H3: Perceived relative advantage of Internet pharmacy service has a direct positive effect upon attitude toward Internet pharmacy service.

H4: Perceived simplicity of Internet pharmacy service has a direct positive effect upon attitude toward Internet pharmacy service.

H5: Perceived compatibility of Internet pharmacy service has a direct positive effect upon attitude toward Internet pharmacy service.

H6: Perceived risk of Internet pharmacy service has a direct negative effect upon attitude toward Internet pharmacy service.

In addition, Holak's model of innovative consumer durables adoption, upon which much of the study model is based, suggests that perceived innovation characteristics exert effects upon one another. Her model specifies that relative advantage exerts a negative effect on risk, simplicity exerts a negative effect on risk and a positive effect on relative advantage, and compatibility exerts a positive effect

on relative advantage. and a negative effect on risk[132] Based on these findings, the theoretical model will propose the following additional hypothesis.

H7: Perceived simplicity has a direct positive effect upon perceived relative advantage.

H8 Perceived simplicity has a direct negative effect upon perceived risk.

H9: Perceived compatibility has a direct negative effect upon perceived risk.

H10: Perceived compatibility has a direct positive effect upon perceived relative advantage.

H11: Perceived relative advantage has a direct negative effect upon perceived risk.

H12: Perceived simplicity and perceived compatibility will be correlated.

3.3.4 Personal Characteristics

The evidence in the adoption of innovations literature with respect to the effect of personal characteristics upon adoption indicate that they are of secondary importance in predicting adoption behind perceptual variables. Evidence in the

[132] Holak SL, Lehmann DR. Purchase intentions and the dimensions of innovation: An exploratory model. *Journal of Product Innovation Management*. 1990;7:59-73.

innovativeness and in-home shopping literature support the consideration of personal characteristics as predictors of innovativeness and home shopping, respectively. There is agreement along these two separate lines of research that the in-home shopper and the innovative consumer possess more formal education and higher total family incomes. Given that these results come from two separate fields of research, there is reason to believe that these two characteristics may contribute significantly to the variance in the intent to adopt Internet pharmacy service. The effect of personal characteristics is presumed to operate upon behavioral intent indirectly through their influence upon attitude.

The hypotheses with regard to the effect of personal characteristics are as follows:

H13: Level of formal education has a direct positive effect upon attitude towards Internet pharmacy service adoption.

H14: Level of total family income has a direct positive effect upon attitude toward Internet pharmacy service adoption.

H15: Level of total family income and level of formal education will be correlated.

CHAPTER 4: RESEARCH METHODOLOGY

This chapter outlines the research methods that were used for conducting this study. This chapter is divided into three sections. The first section outlines the general study design, and describes the sampling frame and the subject pool. The second section describes the instrument development, survey pretest and survey administration procedures. The third section contains a description of the data collection procedures and the statistical method used to analyze the data.

4.1 Study Design

This study employed a cross-sectional non-experimental design. It used a self-report web-survey data collection instrument to measure how intent to adopt Internet pharmacy service is affected by personal characteristics (formal education level and total family income level), perceptual variables (perceived relative advantage, perceived simplicity, perceived compatibility and perceived risk), attitude toward adoption of Internet pharmacy service, and subjective norm toward adoption of Internet pharmacy service. Structural equation modeling with EQS was used to test: 1) the goodness of total model fit; and 2) the statistical significance of paths linking variables within the model. In addition, standardized parameter estimates were computed to provide an estimate of the relative importance of paths within the model.

4.2 Sample Frame

The selection of an appropriate sampling frame and sampling technique is an important first step in conducting research. As is the case with many inferential statistical tests, the results of hypothesis testing procedures are highly dependent on the characteristics of the sample included in the study. Consequently, great care must be taken to select the appropriate sampling frame, given the nature of the research question. For the current research study, the population of interest includes consumers who have access to and use the Internet and are not excluded from using Internet pharmacy service due to external controlling factors (e.g., lack of insurance coverage). Unfortunately, given financial constraints, compromises are often necessary in the sample frame selection process. In such cases, it is important to realize the limitations that result from the sample selection procedure. The sampling frame utilized in this study includes all University of Texas at Austin employees.

There are a number of factors that make this sampling frame appropriate for this research. The University of Texas health plan enrollees have the option to choose prescription benefits that are managed by PAID, Inc. or PCS, Inc. Both prescription benefit companies offer their beneficiaries the option to have their prescriptions filled using an Internet pharmacy service provider (www.merck-medco.com or advancedparadigm.com for PAID, Inc. or PCS, Inc., respectively). By selecting a sample that has insurance that covers prescriptions provided by an Internet pharmacy service, a substantive confounding factor towards pharmacy patronage,

prescription plan coverage, is nullified. That is, since all respondents had insurance coverage for Internet pharmacy service, the effect of prescription insurance coverage will be controlled for. This allowed for an examination of the remaining predictors of Internet pharmacy usage intent.

4.3 Inclusion Criteria

The purpose of this study is to measure predictors of intent to adopt Internet pharmacy service in potential adopters of Internet pharmacy service. Internet pharmacy service represents what Rogers describes as a contingent innovation-decision. According to Rogers, "Contingent innovation-decisions are choices to adopt or reject that can be made only after a prior innovation-decision."[133] Therefore, it is straightforward to assume that potential adopters of Internet pharmacy service, by definition, must have already become adopters of the personal computer (or other web access device), and the Internet before being in a position to make the decision to adopt Internet pharmacy service. More specifically, this research will assume that the market for Internet pharmacy service will include only those consumers who have adopted these previously introduced service and product innovations. Participants included in this research will be contacted via E-mail; therefore, a familiarity with using both web-access technology and the Internet is established. It was not a

[133] Rogers E. *Diffusion of Innovations*. 4th ed. New York: The Free Press, 1995: 30.

requirement that participants had utilized an Internet pharmacy service in the past. It was assumed that, though consumers may not have had direct experience with an Internet pharmacy service provider, they were familiar enough with the concepts of the Internet and electronic commerce to have formed an impression of Internet pharmacy service. Only consumers who have prescription insurance coverage with an Internet pharmacy service option were included in this study to eliminate the confounding influence of insurance coverage upon pharmacy patronage. It is understood that the recipient of the prescription medication does not always make the pharmacy patronage decision. In some cases, such decisions are made by other members of a family (e.g., spouse, son/daughter). For this reason, the research sample included only those individuals who were in charge of making the pharmacy patronage decisions for themselves or others.

The study inclusion criteria were as follows:

1. At least 18 years of age;
2. Self-reported use of a computer or some other web-access device;
3. Self-reported use of the Internet;
4. Self-reported enrollment in a prescription medication insurance program that provides coverage for medications dispensed from an Internet pharmacy service provider; and
5. Self-reported pharmacy patronage decision maker.

4.4 Exclusion Criterion

As stated previously, the purpose of this study was to measure predictors of intent to adopt Internet pharmacy service in potential adopters of Internet pharmacy service that are within the mainstream market. Since individuals that currently use this service have already adopted the service, current users of Internet pharmacy service cannot be considered potential adopters and were excluded from the analysis. Additionally, exclusion of these subjects is congruent with the mainstream market focus of this research, as these current users are more appropriately classified as innovators in reference to the innovation under study.

4.5 IRB Procedures

This research study utilized survey procedures. Study information was collected in such a manner that the survey responses for individual participants could not be identified. The appropriate departmental review procedures were adhered to, and the proposal was granted IRB exempt status by The University of Texas Department of Research Compliance.

4.6 Sample Size

Study data were analyzed using structural equation modeling. Parameter estimates and chi-square tests of fit are sensitive to sample size. In general, many

authors recommend sample sizes of at least 200.[134] It is generally understood that parameter estimates calculated using samples of less than 200 subjects are unstable.[135] Taking a different approach, Bentler and Chou suggest that a ratio of sample size to estimated parameters be used.[136] These authors suggest that a ratio of sample size to parameters estimated be between 5:1 and 10:1. Because there are 24 parameters to estimate in this model (Table 4.1), the target sample size for this research was 240; however, since the lower limit of sample size to number of parameters is 5:1, a sample size of 120 was considered appropriate for analysis.

A sample of 2000 respondents was chosen in an attempt to achieve a target sample size of 240. The published response rates for E-mail surveys vary widely from 6 to 63 percent.[137,138,139,140,141,142] The attainment of this target sample size

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[134] Boomsma A. *On the Robustness of LISREL (Maximum Likelihood Estimation) Against Small Sample Size and Nonnormality*. Doctoral Dissertation. The Netherlands: University of Groningen, 1983.

[135] Marsh HW, Balla JR, MacDonald RP. Goodness-of-fit indexes in confirmatory factor analysis: The effect of sample size. *Psychological Bulletin*. 1988;88:245-258.

[136] Bentler PM, Chou CP. Practical issues in structural equation modeling. *Sociological Methods & Research*. 1987;16:78-117.

[137] Schuldt B, Totten J. Electroinic mail vs. mail survey response rates. *Marketing Research*. 1994;6(1):36-40.

[138] Mehta R, Sivadas E. Comparing response rates and response content in mail versus electronic mail surveys. *Journal of the Market Research Society*. 1995;37(4):429-440.

[139] Tse A, Tse K, Yin C, Ting C, Yi K, Yee K, Hong W. Comparing two methods of sending out questionnaires; E-mail versus mail. Journal of the Market Research Society. 1995;37(4):441-446.

assumed a response rate of at least 15 percent. This figure represented a conservative estimate of the response rate cited in studies that employed E-mail surveys with at least one follow up E-mail (19.1%-63%).[143,144,145] The attainment of this target sample size also took into consideration the exclusion of individuals who had already adopted Internet pharmacy service. Estimates from the published literature suggested that current rates of use should range from 2 to 12 percent.[146,147] For sample size estimation procedures, a conservative estimate of the adoption rate of 20 percent was assumed to ensure adequate sampling.

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[140] Bachmann D, Elfrink J. Tracking the progress of E-mail vs. snail-mail. Marketing Research. 1996;8(2):30-36.

[141] Kittleson M. Determining effective follow-up of E-mail surveys. *American Journal of Health Behavior*. 1997;21(3):193-196.

[142] Bachmann D, Elfrink J, Vazzana G. E-mail and snail-mail face off in rematch. *Marketing Research*. 2000;11(4):10-16.

[143] Schuldt B, Totten J. Electroinic mail vs. mail survey response rates. *Marketing Research*. 1994;6(1):36-40.

[144] Kittleson M. Determining effective follow-up of E-mail surveys. *American Journal of Health Behavior.* 1997;21(3):193-196.

[145] Mehta R, Sivadas E. Comparing response rates and response content in mail versus electronic mail surveys. *Journal of the Market Research Society.* 1995;37(4);429-440.

[146] Schering Laboratories. *Pharmacy.Com: A Virtual Reality*. Kenilworth: Schering Laboratories, Inc, 2000.

[147] Greenfield Online, Inc. Online Drugstores Are Hurt by Not Having a Doctor in. 2000. Web Page. URL: http://www.Greenfield.com/pages/go_article.asp&aid=1333. 21 July 2000.

Table 4.1. Total Number and Types of Parameters to be Estimated in Proposed Research Model

Exogenous Variables				
Variances	Covariances	Direct Effects on Endogenous Variables		Total
S, C, SN,	C↔S	S→RA	RA→A	24
TFI, ED	TFI↔ED	S→RS	RS→A	
E_{RA}, E_{RS}		S→A	TFI→A	
E_A, E_{BI}		C→RA	ED→A	
		C→A	A→BI	
		C→RS	SN→BI	
		RA→RS		

LEGEND

S = Simplicity
C = Compatibility
RA = Relative Advantage
RS = Risk
A = Attitude
SN = Subjective Norm
TFI = Total Family Income
ED = Formal Education
BI = Behavioral Intent
E = Error

In the development of measurement scales, Churchill recommends that researchers follow a well-defined strategy.[148] The first step requires a review of the literature to specify the domain of the construct to be measured. The second step involves the development of items; during this stage, existing scales are evaluated for their utility. Also during this stage, new items may be created in an effort to fill gaps in the literature. If new items are generated, Moore and Benbasat recommend that a panel of judges review the newly generated scale to help enhance content validity.[149]

[148] Churchill GA. A paradigm for developing better measures of marketing constructs. *Journal of Marketing Research.* 1979;16:64-73.

[149] Moore G, Benbasat I. Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*. 1991;2:192-222.

The third step involves piloting the instrument on a representative sample of the target population. The last five steps in Churchill's paradigm involve purifying the scales through iterative pilot testing and assessing the reliability and validity of the measurement scales. Churchill's paradigm was adopted for the development of the instrument used in this research. What follows is a description of how this process was carried out.

4.7 Specifying the Domain of the Construct

The first step involved in this process included conducting a thorough literature review to specify the domain of each construct. A general literature review was presented in Chapter 2. This literature review was used to build the research model presented in Chapter 3. Chapter 3 also includes a description of the constructs of interest.

4.8 Selecting Items for Each Dimension

For each construct described in Chapter 3, a review of the literature was conducted to identify scales previously used to operationalize the perceptual variables included in the theoretical model. These scales were considered on the basis of their: 1) coverage of the pertinent domains of the construct of interest; and 2) psychometric properties (when reported). Where possible, existing scales were used to operationalize the constructs of interest. In general, appropriate scales were identified

to operationalize all four perceptual variables (relative advantage, simplicity, compatibility, and risk), attitude toward Internet pharmacy service, subjective norm toward Internet pharmacy service, and intent to adopt Internet pharmacy service. Published reliability values were available for four of the six scales that were adapted for this study (Table 4.2). What follows is a description of the scales and their respective items.

Table 4.2. Published Cronbach's Alpha Coefficients for Compatibility, Simplicity, Attitude and Subjective Norm Scales

Construct	Scale	Number of Items	alpha
Compatibility	Compatibility	3	0.86, 0.84[a]
Simplicity	Ease of Use	4	0.86-0.97[b]
Attitude	Osgood's Semantic Differential	4	0.82, 0.80[c]
Subjective Norm	Subjective Norm	4	0.81-0.94[d]

[a.] Moore & Benbasat, 1991; Agarwal and Prasad, 1997

[b.] Venkatesh and Davis, 2000; Adams Nelson & Todd, 1992; Morris & Dillon, 1997; Szajna, 1996

[c.] Al-Gahtani and King, 1999; Morris & Dillon, 1997

[d.] Venkatesh & Davis, 2000 (across study groups and time periods)

4.8.1 Perceived Compatibility of Using Internet Pharmacy

To operationalize perceived compatibility (C), the three-item scale developed by Moore and Benbasat was adapted.[150] This scale focused on whether using an Internet pharmacy to have prescriptions filled was compatible with the way a respondent likes to purchase prescriptions, whether using an Internet pharmacy would fit well with the way in which a respondent likes to purchase medication and whether using an Internet pharmacy would fit well with the respondents medication purchasing style. This scale consisted of three items and required a seven-point Likert response format anchored by strongly disagree (1) and strongly agree (7). The

[150] Moore G, Benbasat I. Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research*. 1991;2:192-222.

published psychometric properties of this scale are reported in Table 4.2. The three items that formed the perceived compatibility scale are listed in Appendix 3. Each item was given a score of one through seven and the three item scores were summed to represent a total compatibility score for each respondent (range = 3 to 21). Higher scores on this scale represented more favorable perceptions with regard to how congruent the use of Internet pharmacy service was with existing medication purchasing behaviors.

4.8.2 Perceived Simplicity of Using Internet Pharmacy

As described previously, the ease of use construct identified by Davis is one that conceptually mirrors that of simplicity (S). Previous authors have recognized this conceptual similarity.[151,152] The four perceived simplicity items included in the survey were adapted from the ease of use short scale items of Davis's TAM, with alterations to make them appropriate for adoption of Internet pharmacy service. The items in this scale focused on whether learning to use an Internet pharmacy would be easy, whether it would be easy to get an Internet pharmacy website to do what the respondent wants it to do, whether it would be easy to become skillful at using an Internet pharmacy website, and whether the respondent would find an Internet

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[151] Ibid.

[152] Keil M, Beranek PM, Konsynski BR. Usefulness and ease of use: field study evidence regarding task considerations. *Decision Support Systems.* 1995;13:75-91.

pharmacy website easy to use. The four items in this scale required a seven-point Likert response anchored by strongly disagree (1) and strongly agree (7). The published psychometric properties of this scale are reported in Table 4.2. The four items that form the perceived complexity scale are listed in Appendix 3. Each item was given a score of one through seven. The four individual item scores were summed to represent a total simplicity score for each respondent (range = 4 to 28). Higher scores represented more favorable perceptions with regard to the ease of use of Internet pharmacy service for prescription filling.

4.8.3 Perceived Relative Advantage of Using Internet Pharmacy

Since the TAM's usefulness construct, analogous to relative advantage, was developed for use in the work setting, it was deemed not acceptable to adapt this scale for the purposes of studying Internet pharmacy service adoption. To operationalize relative advantage (RA), three items were taken from the early work of Ostlund.[153] In this early study, Ostlund partitioned relative advantage into three dimensions (time savings, effort savings and monetary value). This framework was both parsimonious and complete in addressing the major components of relative advantage and therefore were adopted for use in this study. The three items focused on the three dimensions identified by Ostlund (time savings, effort savings and monetary value) and required

[153] Ostlund LE. Perceived innovation attributes as predictors of innovativeness. *Journal of Consumer Research*. 1974;1:23-29.

a seven-point Likert response anchored by extremely unlikely (1) to extremely likely (7). These items are listed in Appendix 3. Each item was given a score of one through seven. The three individual item scores were summed to represent a total relative advantage score for each respondent (range = 3 to 21). Higher scores represented a more favorable perception with regard to the relative advantage of using Internet pharmacy service for prescription filling.

4.8.4 Perceived Risk of Using Internet Pharmacy

To operationalize the perceived risk construct (RS), the perceived risk scale used in Carroll and Fincham's study of perceived mail service pharmacy risk was used.[154] As described previously, there are many similarities between mail service pharmacy and Internet service pharmacy. These similarities would compel one to assume that consumer perceptions with regard to certain attributes of both services might be similar. The items from the Carroll and Fincham scale focused on the risk of paying more for a prescription, spending time filling out order forms, not knowing the pharmacist, not having anyone to ask questions, running out of medication, and getting the wrong medication. Two additional items were developed for the purpose of this study to make the scale more complete in measuring the dimensions of risk in

[154] Carroll NV, Fincham JE. Elderly consumers' perceptions of the risks of using mail-order pharmacies. *Journal of Social and Administrative Pharmacy*. 1993;10:123-9.

the context of Internet pharmacy usage. These two items included one focusing on the risk of credit card fraud and another one on the risk of worry about unauthorized persons obtaining information about their health. Each of the items in the perceived risk scale required a seven-point Likert response anchored by extremely unlikely (1) to extremely likely (7). The nine items that formed the perceived risk scale are listed in Appendix 3. Each item was given a score of one through seven. The nine individual item scores were summed to represent a total perceived risk score for each respondent (range = 9 to 63). Higher scores represented a higher perception of risk associated with the use of Internet pharmacy service for prescription filling.

4.8.5 Attitude Toward Internet Pharmacy

To measure attitude toward Internet pharmacy service (A), Osgood's semantic differential technique was used.[155] Consistent with the views of Fishbein and Ajzen, "Osgood's definition of attitude is in terms of a bipolar evaluative dimension."[156] This scale is well-known and has been replicated in many studies conducted in the information technology field.[157,158 ,159,160,161] This scale consisted of one statement

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[155] Osgood C. The nature and measurement of meaning. *Psychological Bulletin*. 1952;49:197-237.

[156] Fishbein M, Ajzen I. *Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research*. Reading: Addison-Wesley, 1975.

[157] Davis FD. User acceptance of information technology: system characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies.* 1993;38:475-87.

and four bipolar evaluative scales, which the respondent used to respond (My using an Internet pharmacy website to have a prescription filled within the next year is:_____). Each seven-point evaluative scale was anchored on each end by adjectives that are conceptual opposites of each other. The response to each item was scored from one to seven. The four response scales were anchored by wise/foolish, good/bad, beneficial/harmful, and pleasant/unpleasant. The scores on these four items were summed to represent the total score on attitude toward using Internet pharmacy service (range = 4 to 28). Higher scores represented a more favorable attitude toward the intent to use Intent to use Internet pharmacy service. In formulating the attitude scale, careful consideration went into specifying the action, target, context and time elements of the item. When using attitude to predict intention, it is important that these elements correspond to the intention to be measured.[162] The four items that formed the attitude scale are listed in Appendix 3.

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[158] Taylor SA, Todd PA. Understanding information technology usage: a test of competing models. *Information Systems Research.* 1995;6:144-176.

[159] Mathieson K. Predicting user intentions: comparing the technology acceptance model with the theory of planned behavior. *Information Systems Research*. 1991;2:173-191.

[160] Szajna B. Software evaluation and choice: predictive validation of the technology acceptance instrument. *MIS Quarterly*. 1994;18(3):319-324.

[161] Morris MG, Dillon A. How user perceptions influence software use. *IEEE Software*. 1997;July/August:59-64.

[162] Ajzen I, Fishbein M. *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs, NJ: Prentice-Hall, 1980: 56.

4.8.6 Subjective Norm Toward Using Internet Pharmacy

To operationalize subjective norm (SN), a two-item global subjective norm scale was adapted from a previous TAM study conducted by Venkatesh and Davis.[163] These two items asked respondents to indicate the degree to which people who influence the respondents' behavior think they should use Internet pharmacy service and the degree to which people who are important to the respondent think they should use Internet pharmacy service. As suggested by Fishbein and Ajzen, a seven-item Likert scale was used for each item to measure agreement with belief (nb_i).[164] These seven-point agreement response scales were anchored by the phrases I should (7) and I should not (1). The belief score on each item was then multiplied by the respondent's motivation to comply (mc_i) with the referent. These seven-point response scales were anchored by the phrases very much (7) and not at all (1). These two multiplicative scores were summed to represent the overall score on normative influence (range = 2 to 98). Higher scores represented a more favorable subjective norm towards the use of Internet pharmacy service for prescription filling. The items used to measure subjective norm toward using Internet pharmacy service are listed in Appendix 3.

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[163] Venkatesh V, Davis FD. A theoretical extension of the technology acceptance model: four longitudinal field studies. *Management Science*. 2000;46:186-204.

[164] Ajzen I, Fishbein M. *Understanding Attitudes and Predicting Social Behavior*. Englewood Cliffs, NJ. Prentice-Hall.1980:74.

4.8.7 Behavioral Intent to Use Internet Pharmacy

The importance of behavioral intent (BI) as a predictor of behavior has been extensively elucidated by Fishbein and Ajzen.[165] When constructing an item that measures behavioral intent, it is important to carefully consider the specificity of the behavior with respect to the subject of the behavior and the situational time frame. As mentioned previously, careful consideration went into ensuring that the action, target, context and time elements of the intention item matched that of the attitude item. The single item chosen for this study asked respondents to indicate the subjective probability of their intent to use an Internet pharmacy to fill a prescription medication order within the next year, using a seven-point response scale anchored by extremely likely (7) and extremely unlikely (1). The response was scored from one to seven. Higher scores represented a greater intent to use Internet pharmacy service for prescription filling. The behavioral intent item is listed in Appendix 3.

4.9 Item Review and Revision

The next step in the instrument development was to present the items to a panel of judges for review and editing. Three experts in the field of adoption of innovations research reviewed each item statement to ensure that item wording was precise and item overlap did not occur. In addition, these experts assessed the face

[165] Ibid., 5.

validity of the scales. All scales were deemed appropriate in terms of content validity, however, content reviewers recommended item wording modification for items in the relative advantage and attitude scales to improve clarity and readability. These scales were modified to address these concerns.

4.10 Order of Questions

Careful consideration was given to the appropriate ordering of questions included in the survey. Section one of the survey included items that are general in nature, uncomplicated and easy to answer, such as the general attitude measurement scale. This is consistent with the approach advocated by Salant and Dillman.[166] These authors encourage beginning a survey with questions that are general in nature and easy to complete.

Sections two through five of the survey consisted of a series of items that operationalized each of the various perceptual constructs of the model. Items that are part of multiple-item scales were grouped together. Some researchers have argued against this practice due to the occurrence of "carryover effects" that may artificially inflate the reliability scores of multiple-item scales measuring the same construct.[167,168] However, a study conducted by Davis and Venkatesh to investigate

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[166] Salant P, Dillman DA. *How to conduct your own survey.* New York: John Wiley and Sons, Inc. 1994.

[167] Radburn N. Question-wording effects in surveys. In Hogarth R, Ed. *Question Framing and Response Consistency*. San Francisco: Jossey-Bass. 1982: 65-67

the consequences of item grouping failed to uncover any significant effects of item-grouping.[169] In three separate experiments involving 23 versions of the TAM instrument (10 grouped and 13 intermixed format surveys) in 822 subjects, the scale reliabilities were 0.91 to 0.98 in all cases with factor cross loadings ranging from 0.25 to 0.30. In addition, multiple regression analysis of the effects of item ordering upon behavioral intent, ease-of-use and usefulness revealed that the effect of item ordering was not significant at an alpha = 0.05. Given the results of this study, it was deemed acceptable to group items according to the construct being measured. Upon completion of this stage of survey development, the instrument was subjected to an initial pilot test.

4.11 Pilot Test 1

During the first phase of pilot testing, links to the study questionnaire were distributed to a convenience sample of 20 graduate students of the Division of Pharmacy Administration in the College of Pharmacy at the University of Texas at Austin. Twelve of the 20 pilot sample participants completed the web survey during the phase one pilot testing period. As a result of participant feedback, two substantive

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[168] Budd RJ. Response bias and the theory of reasoned action. *Social Cognition*. 1987;5:95-107.

[169] Davis FD, Venkatesh V. A critical assessment of potential measurement biases in the technology acceptance model: three experiments. *International Journal of Human-Computer Studies*. 1998;45:19-45.

changes were made to the survey questionnaire. In section two, the directions for the attitude items were augmented in an attempt to reduce participant confusion with item completion. In addition, the anchors for one of the attitude scale items were changed from punishing/rewarding to harmful/beneficial, due to comments regarding the strength of the wording.

4.12 Pilot Test 2

During the second phase of pilot testing, a convenience sample of 35 administrative assistants and staff members from the colleges of Sociology and Natural Sciences at the University of Texas at Austin was recruited. Pilot study participants were given a copy of the study cover letter with a link to the online survey. Twenty-one of the 35 pilot sample members completed the online survey during the phase two pilot testing period.

As a result of participant feedback during the second phase of pilot testing, the instructions for the subjective norm items in section two were augmented. Further elaboration was provided with regard to the way in which to respond to these items. Following the additional refinements made to the survey in the second round of pilot testing, the survey was ready for distribution. The final version of the study survey is provided in Appendix 4.

4.13 Pilot Test Reliability

The reliability of a scale is a measure of the stability and consistency of the scale. It is an assessment of the extent to which respondents can answer similar questions the same way each time.[170] There are four different methods that can be employed to assess reliability. These methods include: 1) test-retest, 2) alternate forms, 3) interrater, and 4) internal consistency.[171] For this study, Cronbach's-alpha, a measure of internal consistency, was used. There is no "gold standard" threshold for evaluating reliability coefficients. However, there are certain guidelines for their interpretation.[172] Values of 0.90 and above can be considered "excellent." Values of 0.80-0.89 can be considered "good", and values of 0.70-0.79 can be considered "adequate." Scales with values of 0.50 and below should be avoided. Bagozzi and Yi, recommend a benchmark reliability threshold of 0.60.[173] This value was accepted as the reliability threshold for scales used in this study.

During the second phase of pilot testing, Cronbach's alpha was used to measure internal consistency of the individual measurement scales. These reliability

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[170] Cronbach LJ. Coefficient alpha and the internal consistency of tests. *Psychometirka*. 1951;16:297-334.

[171] Polit DF, Hungler BP. *Nursing Research: Principles and Methods. 5th ed*. Philadelphia: J.B. Lippencott Company, 1995: 348-349.

[172] Kline RB. *Principles and Practice of Structural Equation Modeling*. New York: The Guilford Press, 1998:194.

[173] Bagozzi RP, Yi Y. On the evaluation of structural models. Journal of the Academy of Marketing Science. 1988;16(1):74-94.

coefficients are displayed for all the study scales in Table 4.3. Aside from the subjective norm scale, all item scales achieved the threshold value of 0.60. However, due to subjective feedback regarding confusion with the completion of the subjective norm items, additional instructions were added before the subjective norm section of the survey to help improve understandability. It was presumed that this would improve the scale's reliability in the full-scale study. Overall, the instrument appeared to demonstrate satisfactory reliability.

Table 4.3. Results of Pilot Test 2 Item Scale Reliability Analysis

Scale	Number of Items	Standardized Item Alpha
Attitude	4	0.960
Subjective Norm	4	0.572
Relative Advantage	3	0.661
Risk	9	0.837
Simplicity	4	0.906
Compatibility	3	0.979

4.14 Validity

Validity is a multifaceted concept that has four basic categories: content, criterion-related, convergent and discriminant, and construct. In addition, the theoretical maximum absolute value for the validity coefficient of a scale is directly dependent upon the reliability of the scale under investigation.[174] That is, the degree of validity of a scale can only exist to the extent that the same scale is reliable. Therefore, it is important to acknowledge the reliability of a scale before describing its validity.

For this research, content validity was assessed through an expert panel evaluation of each measurement scale. The content validity of a scale is a measure of

[174] Nunnally JC, Bernstein IH. *Psychometric theory. 3rd edition*. New York: McGraw-Hill, 1994: 241.

the extent to which the scale adequately represents the domain of the concept.[175] The steps undertaken to ensure content validity were outlined previously. To summarize, a review of the relevant literature was conducted to ensure that each construct was adequately understood. For each scale, items were selected from instruments previously used in similar studies. In addition, items were developed in cases where scales did not fully explore the domain of the construct. The preliminary questionnaire was distributed among a number of experts in the field of diffusion of innovation research to critique both the content and the understandability of the items. When necessary, changes to the questionnaire were made.

4.15 Data Collection

This research utilized a non-experimental, cross-sectional web-survey data collection method. This section describes the procedure of survey distribution.

The pre-notification technique was used to collect data for this study. The effectiveness of pre-notification postcards in increasing response rates for mail-surveys has been well documented in the literature.[176,177,178] However, the data on the

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[175] Davis D, Cosenza RM. *Business Research Decision Making.* 3rd ed. Belmont: Wadsworth Publishing Company, 1993: 348-349.

[176] Schlegelmilch B, Diamantopoulos A. Prenotification and mail survey response rates: A quantitative integration of the literature. *Journal of the Market Research Society.* 1991;33(3):243-255.

[177] Sutton RJ, Zeits LL. Multiple prior notifications, personalization and reminder surveys: do they have an effect on survey response rates? *Marketing Research: a Magazine of Management and Applications.* 1992;4:14-21.

effectiveness of the pre-notification technique for E-mail surveys is lacking. A review of the literature revealed only one study using the pre-notification technique for electronic surveys. This study suggested that response rates are improved with the use of a pre-notification E-mail.[179]

For this study, a pre-notification E-mail was sent to each member of the sample three days before the cover letter was E-mailed. The pre-notification E-mail identified the study investigators, outlined the objectives of the study, and requested participation in the study. The pre-notification E-mail also gave survey participants the option to elect not to participate in the survey by sending an E-mail request to the principal investigator indicating "no survey" in the subject line. All participants that did so were excluded from receiving any further study E-mailings. A printed copy of the pre-notification E-mail can be found in Appendix 5.

The survey cover E-mail contained a hyperlink to the web-survey instrument. This cover E-mail was sent to study participants who did not opt-out of study involvement three days after mailing of the pre-notification E-mail. The survey cover E-mail identified the study investigators, reiterated the study objectives, and

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[178] Pirotta M, Gunn J, Farish S, Karabatsos G. Primer postcard improves postal survey response rates. *Australian & New Zealand Journal of Public Health.* 1999;23:196-197.

[179] Mehta R, Sivadas E. Comparing response rates and response content in mail versus electronic mail surveys. *Journal of the Market Research Society*. 1995;37(4): 429-440.

described the confidentiality and anonymity of individual responses. The survey participants were given 21 days to complete the web-survey. A copy of the cover E-mail can be found in Appendix 6.

The survey was loaded onto a web-server at the College of Pharmacy and was accessible via a web-link that was sent to all survey participants as a part of the survey cover E-mail. A program within the web-survey E-mailed the results of each individual survey to the principal investigator as a text file devoid of any unique identifiers, safeguarding the anonymity of the respondents.

Follow-up E-mails were sent to study participants fourteen days after the cover E-mail mail out date. Due to the anonymity of respondents who completed the survey questionnaire, follow up E-mails with a web-link to the survey were sent to the entire participating sample. These follow up letters reminded respondents of the survey completion deadline, and encouraged respondents to contact the principal investigators if they had any questions with regard to survey completion. Follow-up E-mails have been shown to exert a positive effect on response rates for electronic surveys.[180] A copy of the follow up E-mail can be found in Appendix 7.

[180] Kittleson M. Determining effective follow-up of E-mail surveys. *American Journal of Health Behavior*. 1997;21(3):193-196.

4.15.1 Data Preparation and Screening

Data screening and preparation are important steps in structural equation modeling (SEM). All SEM methods require that certain assumptions of the data be met, especially with regard to the distributional requirements. The following sections describe how the data were prepared and screened prior to analysis.

4.15.2 Missing Values

When examining data for missing values, the pattern of missing data is more important than the amount of missing data. That is, nonrandom missing data are a more serious problem than random missing data. Nonrandom missing data seriously affect the generalizeabilty of the study results; therefore, before deciding what to do with missing data, it is important to attempt to determine if there is any pattern apparent in their distribution. In cases where data are incomplete, an analysis was conducted to estimate the likelihood that the data were missing at random. A between-groups analysis of all study variables was conducted to compare cases with missing data to cases in which data were complete. Independent groups t-tests were used to examine significant differences between the group of cases with complete data and the group of cases with missing data. For cases with missing values, the missing item scores were imputed using multiple imputation.

Multiple imputation is a process used to replace individual missing data points with plausible values, generating a complete dataset. This method provides certain

advantages over other traditional missing data resolution techniques, such as replacing missing values with point estimates or pair wise and list wise deletion. Point estimate replacement can distort variable distributions, reducing standard errors. The end result of which would be an overall increase in Type 1 error rates.[181] Pair-wise and list-wise deletion of data can reduce statistical power and are fully justified only in cases where data are missing completely at random.[182] When used in conjunction with structural equation modeling software, parameter estimation procedures make appropriate inferences even in cases where the missing at random assumption is violated.[183] In contrast, the multiple imputation method uses an iterative Monte Carlo procedure to simulate new values for missing data by drawing from a Bayesian posterior distribution, given the observed data and the most recently imputed missing data.[184] This method imputes parameters for a complete data set with missing values replaced in such a way as to take into account missing-data

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[181] Rubin DB. *Multiple Imputation for Nonresponse in Surveys*. New York: J. Wiley & Sons, 1987.

[182] Benter PM. *EQS Structural Equations Program Manual*. Encino: Multivariate Software, Inc., 1995:196.

[183] Ibid., 197.

[184] Tanner MA, Wong WH. The calculation of posterior distributions by data augmentation. *Journal of the American Stistical Association*. 1987;82:528-550.

uncertainty.[185] Multiple imputation was performed on the survey dataset using Schafer's NORM (v 2.03) statistical software[186].

4.15.3 Normality

Underlying the method of structural equation modeling is the assumption of multivariate normality. Multivariate normality describes the condition in which all variables and all linear combinations of variables are normally distributed. Unfortunately, the assumption of multivariate normality is not readily testable, as it is impractical to test multiple numbers of linear combinations of variables. In addition, those tests that are available are overly sensitive to the detection of violations in this condition.[187] In lieu of a more practical method in which to handle violations in the assumption of multivariate normality, it is recommended that transformations of individual variables be conducted to improve their normality unless there is a convincing reason not to do so. To test for normality, frequency histograms as well as statistics for skew and kurtosis were produced using SPSS. For the analysis of multivariate data, West, Finch, and Curran recommend concern if skew is > |2| and

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[185] Rubin DB. *Multiple Imputation for Nonresponse in Surveys*. New York: J. Wiley & Sons, 1987.

[186] Schafer JL. NORM (version 2.03).[Computer Program]. Available: www.stat.psu.edu/~jls/misoftwa.htm. 1999.

[187] Tabachnick BG, Fidel LS. *Using Multivariate Statistics*. 3rd ed. New York: HarperCollins, 1996: 70.

kurtosis is > |7|.[188] The skew and kurtosis statistics for each variable will be examined. For frequency distributions that meet the criteria escribed by West, Finch and Curan (skew is > |2| and kurtosis is > |7|), appropriate transformations will be conducted in an attempt to produce a distribution with the lowest values for both skew and kurtosis.

An additional measure implemented to address the issue of non-normality concerns the use of robust parameter estimation procedures. For this study, the maximum likelihood parameter estimation method with robust estimates of standard errors (ML, ROBUST) was used. This method produces a Satorra-Bentler scaled chi-squared and estimates of standard errors that are robust in light of violations of the normality assumption and small to moderate sample sizes.[189,190] In addition, this method produces significance tests of parameter estimates that are robust for deviations from the normality assumption.

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[188] Curran PJ, West SG, Finch JF. The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods*. 1996;1:16-29.

[189] Satorra A, Bentler PM. *Scaling Corrections in Covariance Structure Analysis (UCLA Statistics Series 2)*. Los Angeles: University of California, 1988.

[190] Satorra A, Bentler PM. Corrections to test statistic and standard errors in covariance structure analysis. In Von Eye A, Clogg CC (Eds.). *Analysis of Latent Variables in Developmental Research*. Newbury Park: Sage Publications, 1994: 399-419.

4.15.4 Outliers

Univariate outliers are cases with such extreme values on one variable that statistical estimates based on these data become distorted. Because outliers can have a dramatic effect on fit indices, parameter estimates and standard errors, univariate outliers were identified and excluded from the data analysis.[191] An examination of scatter plots and standardized z-scores was conducted using SPSS to identify univariate outliers. As recommended by Tabachnick and Fidell, cases with z-scores in excess of 3.29 ($p < 0.001$) were eliminated from the data set and excluded from further analysis.[192]

4.16 Data Analysis

The procedure selected to analyze the model proposed in this study is path analysis. The popularity of this method is accounted for by its flexibility and utility in the analysis of complex models. Path analysis allows for the testing of specific hypotheses with regard to the nature of complex relationships between theoretical constructs while also allowing for the assessment of overall quality of the model's fit to the data. In addition to direct relationships between variables, this method allows

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[191] West SG, Finch JF, Curran PJ. Structural equation modeling with non-normal variables. In Hoyle R, Ed. *Structural Equation Modeling: Concepts, Issues and Applications*. Thousand Oaks: Sage Publications, 1995: 56-75.

[192] Tabachnick BG, Fidel LS. *Using Multivariate Statistics*. 3rd ed. New York: HarperCollins, 1996: 67.

researchers to examine mediational relationships (rather than simple bivariate prediction) that give rise to the phenomena under investigation.

It is important to note that this analysis method does not explicitly infer causality. Attributing causality is an issue of study design and not statistical analysis. To make such causal influences would require an experimental research design with longitudinal data collection and control of all appropriate confounding variables. However, in cases where conditions do not allow for the use of experimental research methods, the use of non-experimental models, with hypothesized causal relationships guided by theory and prior research, seems suitable.

4.16.1 Hypothesis Testing

To test the hypotheses proposed by this research, a structural equation program (EQS v5.7b) was used. Parameter estimates were calculated using Bentler's Maximum Likelihood Parameter Estimate Method with robust estimates of standard errors (ML, Robust). This method has been suggested in the analysis of models with smaller sample sizes (≤ 250) that violate the assumption of multivariate normality.[193,194] Z-tests were used to analyze the significance of parameter estimates

[193] West SG, Finch JF, Curran PJ. Structural equation modeling with non-normal variables. In Hoyle R, Ed. *Structural Equation Modeling: Concepts, Issues and Applications*. Thousand Oaks: Sage Publications, 1995: 56-75.

[194] Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*. 1999;6(1):1-55.

linking specific variables within the model, specified by the path model depicted in Figure 3.2. The type-one error rate for z-tests of parameter estimates was set to 0.05. Based on the signs and significance of each of the aforementioned parameter estimates, each corresponding hypothesis was tested. Rejection of each hypothesis was dependent upon both the statistical significance of the parameter estimate and the consideration that the sign of the calculated parameter estimate corresponds to the sign of the hypothesized parameter estimate as outlined in the proposed research model (Figure 3.2).

4.16.2 Goodness of Fit Testing

In accordance with the recommendation of Kline and Hu and Bentler, multiple goodness-of-fit indices were reported.[195,196] The fit indices reported include: the Satorra-Bentler SCALED χ^2 statistic, a general estimate of overall model fit that is robust to violations in multivariate normality; the Bentler Comparative Fit Index (CFI), an index analogous to the overall proportion of explained variance (cutoff value ≥ 0.95); and Standardized Root Mean-Square Residual (SRMR), an index based on the standardized residuals (cutoff value ≤ 0.09). However, the value of the Chi-

[195] Kline RB. *Principles and Practice of Structural Equation Modeling*. New York: The Guilford Press, 1998: 130.

[196] Hu L, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*. 1999;6(1):1-55.

squared test statistic as a fit estimator will be underemphasized in light of its sensitivity to large sample sizes.[197]

[197] Kline RB. *Principles and Practice of Structural Equation Modeling*. New York: The Guilford Press, 1998:128.

CHAPTER 5: RESULTS

In this chapter, the characteristics of the study sample are described and the results of hypothesis testing are presented. Reliability analyses are performed to confirm the internal consistency of the scales. The statistical procedures outlined in Chapter 4 for hypothesis testing are applied to the study data. The presentation of SEM results follows the recommendations outlined by Hoyle and Panter.[198] Finally, this chapter concludes with a summary of the results of each hypothesis test.

Study data were collected using an online survey from March 4 to March 28, 2002. Initially, 2000 pre-notification E-mails were distributed. The E-mail server returned 34 E-mails as undeliverable. In addition, 99 respondents chose to opt-out of receiving any future survey mailings. As a result, out of the 2000 respondents included in the study sample, only 1,867 were sent a cover E-mail with a link to the online survey. A total of 347 surveys were submitted to the data collection mailbox. From these 347 surveys, 4 were sent in completely blank. Out of the remaining 343 surveys, 66 had previously used an Internet pharmacy service and 10 did not have prescription insurance supplied through the University of Texas. These 76 responses were excluded from the analysis. In addition, 4 respondents were excluded during the data screening phase because they were found to be univariate outliers. This left a

[198] Hoyle RH, Panter AT. Writing About Structural Equation Models. In Hoyle RH (Ed.). *Structural Equation Modeling: Concepts Issues and Applications*. Thousand Oaks: Sage Publications, 1998: 158-176.

total of 264 usable responses, yielding a total response rate of 13.2 percent. Demographic and user characteristics of the 263 survey respondents are summarized in Table 5.1. Summaries of perceptual variables are displayed in Tables 5.2 through 5.8.

5.1 Demographic Characteristics

The mean age of study participants was 38.9 (± 11.7) years, with a majority of the study sample being female (54.8%). The frequency distribution of the reported levels of education and income of study participants exhibited negative skew. A large percentage of study participants reported membership in the highest categories of both the education and income variables. Given the sampling frame chosen for this research (faculty and staff members of the University of Texas), these results appeared reasonable.

Table 5.1. Study Sample Demographic and Other Characteristics

Variable	n (%)	Mean (SD)
Age (years)		38.9 (11.7)
18-29	77 (29.3)	
30-39	68 (26.0)	
40-49	50 (19.1)	
50-59	57 (21.8)	
60-69	10 (3.8)	
Gender		
Female	144 (55.4)	
Male	116 (44.6)	
Education Level		
High School	3 (1.1)	
Some College	22 (8.4)	
Bachelors Degree	55 (21.0)	
Some Graduate	42 (16.0)	
Graduate Degree	140 (53.4)	
Income Level		
≤19,999	41 (16.9)	
20-29,999	35 (14.4)	
30-39.999	32 (13.2)	
40-54,999	27 (11.1)	
55-69,999	26 (10.7)	
70-84,999	23 (9.5)	
≥85,000	59 (24.3)	
Race/Ethnicity		
Black	2 (0.8)	
Chicano/Hispanic	14 (5.4)	
White	210 (81.7)	
Asian or Pacific Islander	25 (9.7)	
Other	6 (2.3)	
Primary Internet Access Site		
Home	73 (28.0)	
Work	180 (69.0)	
Other	8 (3.0)	
UT Insurance Plan		
Humana	106 (40.3)	
UT Select	157 (59.7)	

Table 5.2. Mean and Frequency Distribution of Compatibility Scale (3 items)

					Frequency Distribution of Responses* (%)						
Item	**Compatibility Items**	**N**	**Mean**	**SD**	**Strongly Agree**			**Neutral**			**Strongly Disagree**
1	Using an Internet pharmacy website to have my prescriptions filled would be compatible with all aspects of the way that I like to purchase medications.	257	3.71	1.60	5.8	8.6	12.8	29.6	20.2	12.8	10.1
2	I think that using an Internet pharmacy website would fit well with the way in which I like to purchase prescription medications.	259	3.82	1.68	6.9	10.0	15.8	27.0	16.2	13.1	10.8
3	Using an Internet pharmacy website to have prescriptions filled would fit into my prescription medication purchasing style.	260	3.82	1.66	6.5	10.0	15.8	28.5	15.0	14.2	10.0
	Overall Mean	**257**	**11.31**	**4.67**							

*Items scored strongly agree (7) to strongly disagree (1)

Table 5.3. Mean and Frequency Distribution of Simplicity Scale (4 items)

					Frequency Distribution of Responses* (%)						
Item	**Simplicity Items**	**N**	**Mean**	**SD**	**Strongly Agree**			**Neutral**			**Strongly Disagree**
1	Learning to use an Internet pharmacy website to have my prescriptions filled would be easy for me.	259	6.05	1.26	49.8	26.3	10.8	7.7	3.5	1.5	0.4
2	I would find it easy to get an Internet pharmacy website to do what I want it to do.	257	5.23	1.43	22.6	24.9	22.6	18.7	6.6	3.9	0.8
3	It would be easy for me to become skillful at using an Internet pharmacy website.	260	5.99	1.17	42.3	31.2	16.2	6.2	2.7	1.2	0.4
4	I would find an Internet pharmacy website easy to use.	258	5.58	1.32	29.5	30.6	18.2	15.9	2.7	2.3	0.8
	Overall Mean	**254**	**22.88**	**4.45**							

*Items scored strongly agree (7) to strongly disagree (1)

Table 5.4. Mean and Frequency Distribution of Relative Advantage Scale (3 items)

	Question: Please indicate the likelihood that the use of an Internet pharmacy website for prescription filling is associated with the following benefits:										
					Frequency Distribution of Responses* (%)						
Item	**Items**	**N**	**Mean**	**SD**	**Extremely Likely**	**Quite Likely**	**Slightly Likely**	**Neither**	**Slightly Unlikely**	**Quite Unlikely**	**Extremely Unlikely**
1	Saves time	260	4.97	1.70	16.5	28.1	30.0	6.2	4.6	9.2	5.4
2	Saves effort	261	5.25	1.45	17.6	32.6	28.7	8.4	6.5	3.1	3.1
3	Saves money	261	4.35	1.32	5.4	11.1	29.5	33.7	10.7	6.9	2.7
	Overall Mean	**260**	**14.57**	**3.55**							

* Items scored extremely likely (7) to extremely unlikely (1)

Table 5.5. Mean and Frequency Distribution of Perceived Risk Scale (9 items)

Question: How likely to you believe the use of an Internet pharmacy website for prescription filling is associated with the following risks?											
					Frequency Distribution of Responses (%)						
Item	Perceived Risk Items	N	Mean	SD	Extremely Likely	Quite Likely	Slightly Likely	Neither	Slightly Unlikely	Quite Unlikely	Extremely Unlikely
1	Paying more for my prescriptions	260	3.63	1.34	0.8	6.2	20.8	28.1	23.5	13.8	6.9
2	Paying more in fraudulent credit card charges	259	3.66	1.69	3.5	8.1	28.6	16.6	9.3	22.0	12.0
3	Spending a great deal of time filling out online order forms	260	4.45	1.53	4.2	21.2	36.9	9.6	13.8	9.6	4.6
4	Not knowing pharmacist who fills my prescriptions	259	5.56	1.68	42.5	19.7	12.0	15.1	3.5	3.1	4.2
5	Having no one to ask questions about my medication	259	5.10	1.64				11.2	8.9	6.6	3.1
6	Worry about running out of medicine before my order arrives	258	4.92	1.32				13.6	7.4	5.8	1.2
7	Worry about getting the wrong medicine.	260	4.45	1.42	5.8	14.6	38.1	16.9	12.3	10.0	2.3
8	Worry about unauthorized persons gaining access to private information about my health	260	4.81	1.65	14.6	24.2	26.9	13.5	7.3	9.2	4.2
9	Actually running out of my medicine before my order arrives	259	4.72	1.26	6.6	15.1	46.7	15.4	9.3	5.4	1.5
	Overall Mean	**255**	**41.37**	**9.03**							

* Items scored to extremely likely (7) to extremely unlikely (1)

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Table 5.6. Mean and Frequency Distribution of Attitude Scale (4 Items)

Question: Use of an Internet pharmacy website to have a prescription filled within the next year is:												
					Frequency Distribution of Responses (%)							
Item	**N**	**Mean**	**SD**		**extremely**	**quite**	**slightly**	**neither**	**slightly**	**quite**	**extremely**	
1	259	4.53	1.23	**Wise**	7.3	16.2	16.2	47.5	8.5	3.1	1.2	**Foolish**
2	257	4.67	1.22	**Good**	8.9	17.5	19.5	42.8	8.6	1.9	0.8	**Bad**
3	257	4.86	1.26	**Beneficial**	11.3	22.2	21.4	34.2	8.6	1.9	0.4	**Harmful**
4	256	4.75	1.25	**Pleasant**	11.3	16.0	23.4	39.1	7.4	1.6	1.2	**Unpleasant**
Overall Mean	255	18.78	4.45									

* Items scored extremely wise/good/beneficial/pleasant (7) to extremely foolish/bad/harmful/unpleasant (1)

Table 5.7. Mean and Frequency Distribution of Subjective Norm Scale (4 items)

					Frequency Distribution of Responses* (%)						
Item		**N**	**Mean**	**SD**	**I should**			**neither**			**I should not**
sn_1	People who influence my behavior think I (should--should not) use an Internet pharmacy website to have a prescription filled in the next year.	254	4.06	0.89	2.8	3.5	5.9	79.1	3.9	2.4	2.4
					Very Much			**neither**			**Not at all**
mc_1	Generally speaking, how much do you want to do what people who influence your behavior think you should do?	257	3.96	1.35	1.2	8.6	28.0	31.5	14.4	10.5	5.8
					I should			**neither**			**I should not**
sn_2	People who are important to me think that I (should--should not) use an Internet pharmacy website to have a prescription filled in the next year.	252	4.06	0.84	2.4	2.4	7.5	80.6	2.8	2.0	2.4
					Very Much			**neither**			**Not at all**
mc_2	Generally speaking, how much do you want to do what people who are important to you think you should do?	257	4.39	1.35	2.7	17.5	32.3	24.1	13.2	7.0	3.1
	Overall Mean**	**250**	**33.8**	**11.9**							

* Subjective norm items scored I should (7) to I should not (1); motivation to comply items scored very much (7) to not at all (1)

**Scale score calculated using the following multiplicative equation ($sn_1mc_1 + sn_2mc_2$)

Table 5.8. Mean and Frequency Distribution of the Behavioral Intent

Question: I intend to use an Internet pharmacy website to have a prescription filled within the next year.									
			Frequency Distribution of Responses* (%)						
N	Mean	SD	Extremely Likely	Quite Likely	Slightly Likely	Neither	Slightly Unlikely	Quite Unlikely	Extremely Unlikely
259	3.56	1.85	5.0	10.0	25.5	9.3	12.4	20.8	17.0

* Items scored extremely likely (7) to extremely unlikely (1)

5.2 Data Preparation and Screening

Before conducting structural equation modeling (SEM) analysis, it is worthwhile to expend some effort screening and preparing the data. Unlike other statistical techniques, such as ANOVA, where distributional assumptions can be violated with relative impunity, SEM techniques require adherence to normality assumptions. Data problems not addressed during the data screening step can result in the failure of a model fitting program to converge on a solution. This section describes the steps conducted to ascertain adherence to distributional assumptions. Also, this section describes the techniques employed to deal with missing data.

5.2.1 Non Normality

Data were entered into an SPSS data file for screening. The first step in data screening involved an assessment of non-normality. With regard to the issue of non-normality in the analysis of multivariate data, West, Finch, and Curran recommend concern if skew is > |2| and kurtosis is > |7|.[199] An examination of the skew and kurtosis statistics for each variable failed to identify any distributions that exceeded these threshold values (See Appendix 8 for Histograms).

However, due to some lingering concern regarding the effects of deviations from normality upon interpretation of the chi-squared statistic and standard errors, as

specified in the study methodology, the ML, ROBUST estimation method, which produces parameter estimates that are robust for deviations from the normality assumption, was used in the estimation of parameters and model fit indices.

5.2.2 Outliers

Using the criterion recommended by Tabachnick and Fidell (z-score > + 3.29 or < -3.29), an analysis of univariate outliers was conducted.[200] Using this criterion, one univariate outlier was identified in each of four respondents. These outliers were spread across the perceived risk and perceived ease of use variables and ranged in z-score from -3.43 to -3.85. The cases involving these four outliers were excluded from the analysis.

5.2.3 Missing Data

There were 72 instances of missing data across all respondents and variables. These cases of incomplete data were spread across 43 respondents (16.1%). Within each individual variable, the rate of missing data did not exceed 7.2 percent (range 0.4% to 7.2%). To discern if there were any patterns dictating the occurrence of

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[199] Curran PJ, West SG, Finch JF. The robustness of test statistics to nonnormality and specification error in confirmatory factor analysis. *Psychological Methods*. 1996;1:16-29.

[200] Tabachnick BG, Fidel LS. *Using Multivariate Statistics*. 3rd ed. New York: HarperCollins, 1996: 67.

missing data within the study sample, cases with incomplete and full data were subdivided into two groups and an independent groups t-test was performed across each study variable. This analysis failed to uncover any significant differences between the missing data sample and the full data sample across all study variables (p-values ranging from 0.934 to 0.210). The results of this analysis supported the argument that missing data were missing at random, and there was no distinguishable systematic pattern underlying the incidence of missing data.[201,202]

Multiple imputation was used to impute missing values. The resulting covariance matrix is provided in Table 5.9. The covariance matrix is also provided in Appendix 9.

[201] Rubin DB. Inference and missing data. *Biometrika*. 1976;63:581-592

[202] West SG. New approaches to missing data in psychological research: Introduction to the special section. *Psychological Methods*. 2001;6(4):315-316.

Table 5.9. Raw Study Data EQS Input Covariance Matrix

	A	SN	BI	RA	RS	S	C	ED	TFI
A	21.09								
SN	10.83	122.30							
BI	4.77	4.21	3.28						
RA	8.93	7.33	2.47	11.95					
RS	-14.91	-4.09	-3.29	-6.59	99.27				
S	7.35	0.99	1.02	4.48	-12.03	18.94			
C	12.57	10.64	3.91	9.55	-17.02	8.70	21.52		
ED	-0.50	1.38	-0.19	-0.66	0.54	-0.30	-0.65	1.37	
TFI	1.76	0.32	0.67	0.02	-5.45	-0.44	0.93	0.04	5.14

LEGEND

S = Simplicity
C = Compatibility
RA = Relative Advantage
RS = Risk
A = Attitude
SN = Subjective Norm
TFI = Total Family Income
ED = Formal Education
BI = Behavioral Intent

Represents covariance matrix after multiple imputation of missing values

5.3 Internal Consistency

Cronbach's alpha was used to confirm the internal consistency of the measurement scales of the survey instrument using the entire useable sample of responses. These reliability coefficients are displayed in Table 5.10. Each measurement scale demonstrated a composite reliability exceeding the 0.60 threshold value suggested by Bagozzi and Yi.[203]

[203] Bagozzi RP, Yi Y. On the evaluation of structural models. *Journal of the Academy of Marketing Science*. 1988;16(1):74-94.

Table 5.10. Reliability Analysis of Study Scales

Scale	Number of Items	Standardized Item Alpha
Attitude	4	0.93
Subjective Norm	4	0.85
Relative Advantage	3	0.71
Risk	9	0.86
Simplicity	4	0.90
Compatibility	3	0.94

5.4 Data Analysis

A structural equation modeling program (EQS v5.7b) was used to analyze model fit and produce parameter estimates. As stated previously, maximum-likelihood estimation with robust estimates of standard errors (ML,ROBUST) was used to derive fit statistics and parameter estimate standard errors. The fit indices for the proposed research model are displayed in Table 5.11.

Table 5.11. Goodness of Fit Indicators for Proposed Research Model

Measure	Recommended Value	Model Result
Chi-Squared	not significant	$p < 0.001$
Scaled Chi-Squared	not significant	$p < 0.001$
CFI	> 0.95	0.915
SRMR	< 0.09	0.094

According to the results of the model fitting program, the independence model that tests the hypothesis that all variables are uncorrelated was soundly rejected (χ^2 = 0.91). In addition, the hypothesized model exhibited substandard fit in accordance with the conservative threshold values specified a priori (CFI = 0.915, SRMR = 0.91). However, using more traditional—less conservative—threshold criteria, the hypothesized model exhibited satisfactory fit (CFI > 0.90, and SRMR < 0.10).[204,205]

5.4.1 Hypothesis Testing

Individual hypotheses were tested by considering both the sign and significance of individual model parameters. The results of parameter estimation procedures for each hypothesis are displayed in Table 5.12. The results for estimation of the remaining parameter estimates are displayed in Appendix 10. The hypothesized model structural equations with squared multiple correlations are

[204] Kline RB. *Principles and Practice of Structural Equation Modeling*. New York: The Guilford Press, 1998:131.

[205] Bentler PM, Bonett DG. Significance tests and goodness-of-fit in the analysis of covariance structures. *Pscyhological Bulletin*. 1980;88:588-606.

displayed in Table 5.13. The path diagram is displayed in Figure 5.1. The following section includes a summary of the tests of each hypothesis.

Table 5.12. Proposed Research Model Parameter Estimates with Significance Levels

Model Component	Standardized Parameter Estimate	z-value	Hypothesis	Hypothesis Supported
A→BI	0.566	10.43***	H1	Yes
SN→BI	0.191	4.09***	H2	Yes
RA→A	0.337	5.16***	H3	Yes
S→A	0.132	2.89**	H4	Yes
C→A	0.320	5.35***	H5	Yes
RS→A	-0.108	-2.11*	H6	Yes
S→RA	0.025	0.44	H7	No
S→RS	-0.181	-2.77**	H8	Yes
C→RS	-0.362	-4.49***	H9	Yes
C→RA	0.577	9.68***	H10	Yes
RA→RS	0.052	0.70	H11	No
C↔S	0.334	4.89***	H12	Yes
ED→A	-0.111	-2.61**	H13	No
TFI→A	0.014	0.32	H14	No
TFI↔ED	-0.064	-1.08	H15	No

LEGEND

S = Simplicity
C = Compatibility
RA = Relative Advantage
RS = Risk
A = Attitude
SN = Subjective Norm
TFI = Total Family Income
ED = Formal Education
BI = Behavioral Intent

* = $p < 0.05$
** = $p < 0.01$
*** = $p < 0.001$

Table 5.13. Table of Standardized Model Equations and Squared Multiple Correlations

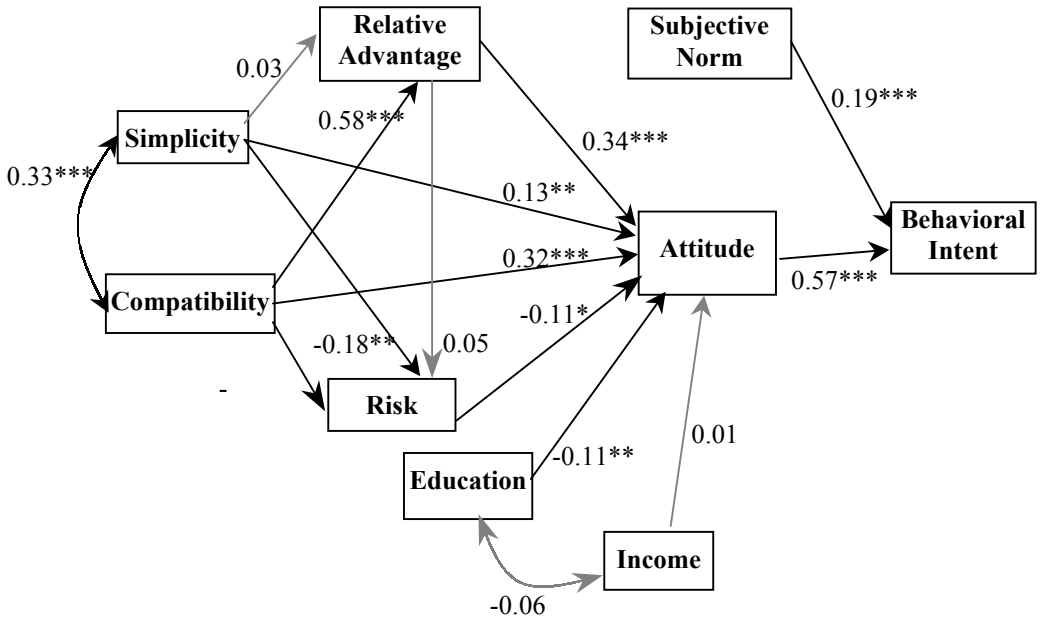
Dependent Variable	Model Equations	R^2
BI	= 0.566***A + 0.191***SN + 0.802ε_{BI}	0.357
A	= .337***RA – 0.108*RS + 0.132**S + 0.320***C - 0.111**ED + 0.014TFI + 0.720ε_{A}	0.482
RA	= 0.025S + 0.577***C + 0.8104ε_{RA}	0.344
RS	= 0.052RA - 0.181**S – 0.362***C + 0.904ε_{RS}	0.184

LEGEND

S = Simplicity	SN = Subjective Norm
C = Compatibility	TFI = Total Family Income
RA = Relative Advantage	ED = Formal Education
RS = Risk	BI = Behavioral Intent
A = Attitude	ε = Error

* = $p < 0.05$
** = $p < 0.01$
*** = $p < 0.001$

Figure 5.1. Proposed Research Model Results



* = p < 0.05
** = p < 0.01
*** = p < 0.001

H1: A more favorable attitude towards Internet pharmacy service has a significant positive effect upon intent to adopt Internet pharmacy service.

The parameter representing this hypothesis is both positive and significant (A→BI = 0.566, t-value = 10.43, $p < 0.001$). This finding suggests that there is a positive effect of attitude toward Internet pharmacy service upon intent to use Internet pharmacy service, therefore, supporting this hypothesis.

H2: A more favorable subjective norm towards Internet pharmacy service has a significant positive effect upon intent to adopt Internet pharmacy service.

The parameter representing this hypothesis is both positive and significant (SN→BI = 0.191, t-value = 4.09, $p < 0.001$). This finding suggests that there is a positive effect of subjective norm toward Internet pharmacy service upon intent to use Internet pharmacy service, therefore, supporting this hypothesis.

H3: Perceived relative advantage of Internet pharmacy service has a direct positive effect upon attitude toward Internet pharmacy service.

The parameter representing this hypothesis is both positive and significant (RA→A = 0.337, t-value = 5.16, $p < 0.001$). This finding suggests that perceived relative advantage exerts a positive influence upon attitude toward Internet pharmacy service, therefore, supporting this hypothesis.

H4: Perceived simplicity of Internet pharmacy service has a direct positive effect upon attitude toward Internet pharmacy service.

The parameter representing this hypothesis is both positive and significant (S→A = 0.132, t-value = 2.89, $p < 0.01$). These findings suggest that perceived simplicity exerts a positive influence upon attitude toward Internet pharmacy service, therefore, supporting this hypothesis.

H5: Perceived compatibility of Internet pharmacy service has a direct positive effect upon attitude toward Internet pharmacy service.

The parameter representing this hypothesis is both positive and significant (C→A = 0.320, t-value = 5.35, $p < 0.001$). These finding suggest that perceived compatibility exerts a positive influence upon attitude toward Internet pharmacy service, therefore, supporting this hypothesis.

H6: Perceived risk of Internet pharmacy service has a direct negative effect upon attitude toward Internet pharmacy service.

The parameter representing this hypothesis is negative and significant (RS→A = -0.108, t-value = -2.11, $p < 0.05$). This finding suggests that perceived risk exerts a negative influence upon attitude toward Internet pharmacy service, therefore, supporting this hypothesis.

H7: Perceived simplicity has a direct positive effect upon perceived relative advantage of using Internet pharmacy service.

The parameter representing this hypothesis is positive but not significant (S→RA = 0.025, t-value = 0.44, p = N.S.). This finding does not support the *a priori* hypothesis that perceived simplicity exerts a positive influence upon perceived relative advantage of Internet pharmacy service.

H8: Perceived simplicity has a direct negative effect upon perceived risk of using Internet pharmacy service.

The parameter representing this hypothesis is negative and significant (S→RS = -0.181, t-value = -2.77, $p < 0.01$). These findings suggest that perceived simplicity exerts a negative influence upon perceived risk of Internet pharmacy service, therefore, supporting this hypothesis.

H9: Perceived compatibility has a direct negative effect upon perceived risk of using Internet pharmacy service.

The parameter representing this hypothesis is both negative and significant (C→RS = -0.362, t-value = -4.49, $p < 0.001$). This finding suggests that perceived compatibility exerts a negative influence upon perceived risk of Internet pharmacy service, therefore, supporting this hypothesis.

H10: Perceived compatibility has a direct positive effect upon perceived relative advantage of using Internet pharmacy service.

The parameter representing this hypothesis is both positive and significant (C→RA = 0.434, t-value = 9.53, $p < 0.001$). This finding suggests that perceived compatibility exerts a positive influence upon perceived relative advantage of Internet pharmacy service, therefore, supporting this hypothesis.

H11: Perceived relative advantage has a direct negative effect upon perceived risk of using Internet pharmacy service.

The parameter representing this hypothesis is positive and is not significant (RA→RS = 0.052, t-value = 0.700, p = N.S.). This finding does not support the *a priori* hypothesis that perceived relative advantage exerts a negative influence upon perceived risk of Internet pharmacy service.

H12: Perceived simplicity and perceived compatibility will be correlated.

The parameter representing this hypothesis is significant (C↔S = 0.334, t-value = 4.89, p = < 0.001). This finding supports the *a priori* hypothesis that perceived simplicity and perceived compatibility are correlated.

H13: Level of formal education has a direct positive effect upon attitude towards Internet pharmacy service adoption.

The parameter representing this hypothesis is both negative and significant (ED→A = -0.111, t-value = -2.61, $p < 0.01$). This finding suggests that level of formal education has a direct negative effect upon attitude towards Internet pharmacy adoption, therefore disconfirming this hypothesis.

H14: Level of total family income has a direct positive effect upon attitude toward Internet pharmacy service adoption.

The parameter representing this hypothesis is positive and not significant (TFI→A = 0.14, t-value = 0.320, p = N.S.). This finding suggests that level of total family income did not have a significant direct positive effect upon attitude towards Internet pharmacy adoption, therefore, disconfirming this hypothesis.

H15: Level of total family income and level of formal education will be correlated.

The parameter representing this hypothesis is not significant (TFI↔ED = -0.064, t-value = -1.08, p = N.S.). This finding fails to support the *a priori* hypothesis that total family income and level of formal education are correlated.

5.5 Model Modification

In cases where the hypothesized model does not demonstrate adequate fit with the data, it is customary to proceed with post-hoc model respecification.[206] To determine which parameters should be specified as free, rather than fixed, during successive runs, a multivariate Lagrange Multiplier test was conducted. This procedure identified three theoretically justifiable model paths that would significantly improve model chi-squared. The suggestions included: 1) adding a covariance between compatibility and subjective norm; 2) adding a direct path from compatibility to behavioral intent; and 3) adding a direct path between total family income and risk. These paths with the corresponding estimates of chi-squared improvement are displayed in Table 5.14.

[206] Kline RB. *Principles and Practice of Structural Equation Modeling*. New York: The Guilford Press. 1998:132.

Table 5.14. Results of Multivariate Lagrange Multiplier Test

Incremental Step	Parameter to be Set Free	Cumulative D.F. Change	Incremental Chi-Squared Change	Chi-Squared P-value
1	C↔SN	1	14.655	0.000
2	C→BI	2	11.895	0.001
3	TFI→RS	3	8.823	0.003

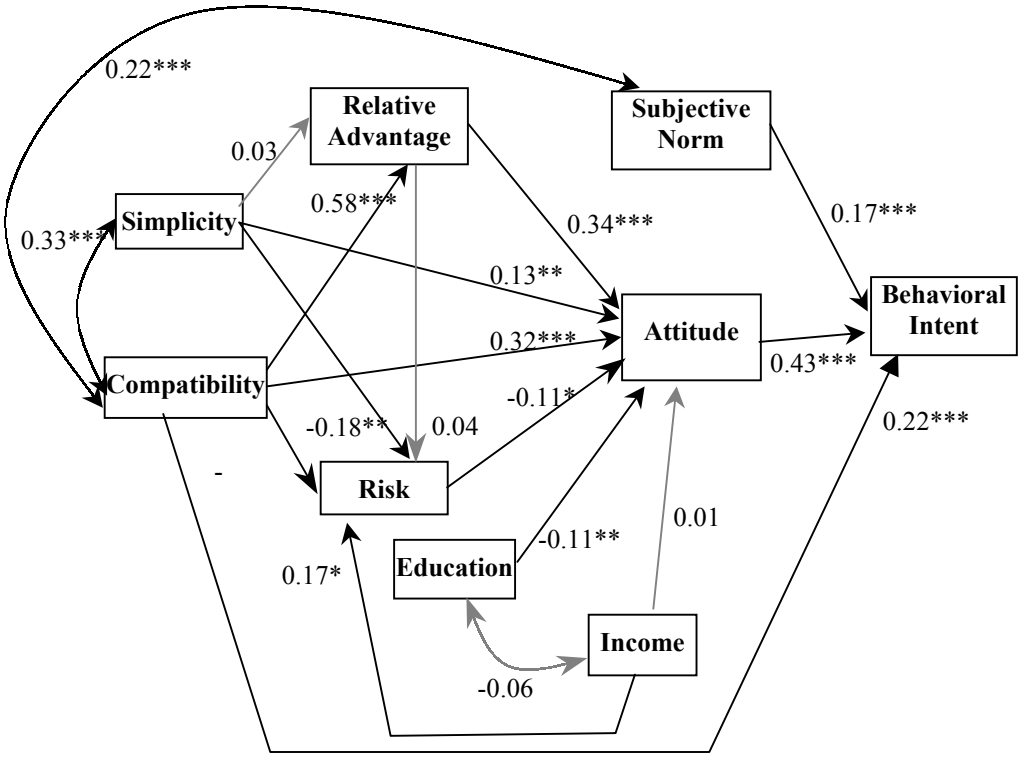
The three theoretically justifiable paths were added to the model. The respecified model is displayed in Figure 5.2. The respecified model demonstrated adequate fit with the data (SRMR = 0.055, CFI = 0.978). The resulting model fit indices are displayed in Table 5.15. Parameter estimates of the respecified model are displayed in Table 5.16.

Table 5.15. Goodness of Fit Indicators for Respecified Research Model

Measure	Recommended Value	Model Result
Chi-Squared	not significant	p = 0.039
Scaled Chi-Squared	not significant	p = 0.043
CFI	> 0.95	0.978
SRMR	< 0.09	0.055

CFI = Comparative Fit Index
SRMR = Standardized Root Mean Residual

Figure 5.2. Respecified Research Model



* = p < 0.05
** = p < 0.01
*** = p < 0.001

Table 5.16. Respecified Research Model Parameter Estimates with Significance Level

Model Component	Standardized Parameter Estimate	z-value
A→BI	0.428	6.695***
SN→BI	0.172	3.593***
C→BI	0.216	3.316***
RA→A	0.337	5.157***
S→A	0.132	2.903**
C→A	0.320	5.375***
RS→A	-0.108	-2.129*
ED→A	-0.111	-2.607**
TFI→A	0.014	-0.323
S→RS	-0.176	-2.747**
C→RS	-0.349	-4.396***
RA→RS	0.043	0.594
TFI→RS	0.168	-3.100**
S→RA	0.025	0.438
C→RA	0.577	9.680***
C↔S	0.330	4.903***
TFI↔ED	-0.064	-1.076
C↔SN	0.223	3.544***

LEGEND

S = Simplicity
C = Compatibility
RA = Relative Advantage
RS = Risk
A = Attitude
SN = Subjective Norm
TFI = Total Family Income
ED = Formal Education
BI = Behavioral Intent

* = $p < 0.05$
** = $p < 0.01$
*** = $p < 0.001$

CHAPTER 6: DISCUSSION

This section examines more closely the findings of this study. The discussion is presented in two sections. The first section concentrates on the findings of the originally proposed model, focusing upon relevant significant and insignificant findings. The theoretical and practical implications of these findings are offered. The second section explores the results of the model modifications with a focus on directions for future research. This section closes with a discussion of the study limitations and some concluding remarks.

The goals of this research study were to analyze the relationships between intent to adopt Internet pharmacy service and selected variables (perceived relative advantage, perceived simplicity, perceived compatibility, perceived risk, attitude towards Internet pharmacy service use, subjective norm towards Internet pharmacy service use, total family income and formal education level) and to assess the relative importance of each variable in the prediction of intent to adopt Internet pharmacy service.

The results of this research suggest that only certain variables exert a significant influence upon the intent to use an Internet pharmacy service for prescription filling. These predictors are, in order of influence: attitude towards Internet pharmacy service use (total effect = 0.566), perceived compatibility of Internet pharmacy service (total effect = 0.312), subjective norm towards Internet pharmacy service use (total effect = 0.191), perceived relative advantage of Internet

pharmacy service (total effect = 0.188), perceived simplicity of Internet pharmacy service (total effect = 0.090), formal education level (total effect = -0.063), and perceived risk of Internet pharmacy service (total effect = -0.061).

6.1 Behavioral Intent to Use Internet Pharmacy Service

Overall, this research identified a model that is strong in its ability to explain behavioral intent to adopt Internet pharmacy service ($R^2 = 0.357$). According to this model, both attitude and subjective norm were found to be important factors exerting a direct influence upon behavioral intent to use Internet pharmacy service. An examination of the total effect of all variables included in the model revealed that attitude towards Internet pharmacy use was the single most important factor influencing intent to use Internet pharmacy. Therefore, health systems that wish to encourage the adoption of Internet pharmacy use should focus efforts on modifying consumer attitudes toward the use of this service. This can be accomplished by developing promotional policies that target the perceptual beliefs that are most valuable in influencing attitude (described in greater detail below). The importance of attitude and subjective norm as predictors of behavioral intent and system usage in the information technology literature has been well-established through previous empirical works.[207,208,209,210] This research supports the use of Theory of Reasoned

[207] Robey D. User attitudes and management information system use. *Academy of Management Journal*. 1979;22:527-538.

Action-based models in describing consumer adoption of web-enabled health service innovations. The TRA assumes that factors that predict a specified behavior do so by their direct or indirect influence upon attitude or subjective norm.

In contrast to the TAM, upon which this model was based, the research model suggests that subjective norm has a significant direct influence upon intent to use Internet pharmacy service. This difference between models can be explained by the nature of the innovation and the context within which the adoption event takes place. Davis's TAM examines the acceptance of technological innovations in the workplace. Most workplace innovations are designed to improve work efficiency or support the achievement of organizational goals. Because an organizational appraisal system provides for the distribution of rewards contingent upon personal achievement towards organizational goals, the results of subjective norm in workplace adoption may be nullified. In contrast, this research suggests that the decision to adopt Internet pharmacy service relies more heavily upon subjective norm when compared to adoption-decisions involving workplace innovations. This may be an indication that the opinions and thoughts of family members factor in to the decision regarding what

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[208] Swanson EB. Management information system: Appreciation and involvement. *Management Science*. 1974;21:178-188.

[209] Davis FD. User acceptance of information technology: system characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies.* 1993;38:475-87.

[210] Al-Gahtani SS, King M. Attitudes, satisfaction and usage: factors contributing to each in the acceptance of information technology. *Behaviour & Information Technology*. 1999;18:277-297.

pharmacy one should patronize. The importance of subjective norm in predicting behavioral intent of Internet pharmacy service encourages further study investigating the use of the subjective norm construct in future information technology and service innovation adoption research.

One unexpected finding of this research concerned the influence of perceived compatibility upon behavioral intent, with the compatibility variable exerting both a direct and indirect effect upon behavioral intent towards use of Internet pharmacy service. Such a relationship is not entirely foreign. Davis's original TAM described a similar finding with the ease of use variable, which exerted both a direct and indirect influence upon system use.[211] This finding in the present study underscores the importance of the perceived compatibility variable. It is worthy to note, however, that this relationship was discovered, rather than hypothesized, during *post hoc* model modification procedures. Therefore, these results require confirmation through future research.

6.2 Attitude Towards Internet Pharmacy Service

The importance of attitude in predicting behavior in the setting of technology acceptance has been discussed previously. In this study, perceived relative

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[211] Davis FD. User acceptance of information technology: system characteristics, user perceptions and behavioral impacts. *International Journal of Man-Machine Studies.* 1993;38:475-87.

advantage, perceived simplicity, perceived compatibility, and level of formal education were found to be factors exerting a direct influence upon attitude towards Internet pharmacy service. By uncovering underlying relationships between beliefs and attitude, this research gives policy makers a better understanding of the relationship between perceived characteristics of Internet service and attitudes toward the use of Internet pharmacy service. Since attitude toward using Internet pharmacy service proved to be the most important factor influencing intent to use Internet pharmacy service, an understanding of the factors explaining attitude towards Internet pharmacy use provides system developers and marketers with insight that may be helpful to influence the rate and extent of adoption of these services, which will maximize overall return on investment.

Of particular interest are two hypothesized relationships that were disconfirmed in the analysis of the data. In contrast to what was hypothesized *a priori*, the effect of total family income level was found to be non-significant and the effect of education level was found to be opposite to what was hypothesized.

These findings suggest that total family income may have no bearing upon attitude towards the use of Internet pharmacy service. There is prior research to suggest that, when compared to perceptual variables, demographic variables are poor predictors of innovative adoption behavior. In two studies conducted by Ostlund, personal variables were found to be of only marginal importance when compared to

perceptual variables in improving prediction of innovative product purchasing behaviors.[212]

The influence of education level upon attitude has some interesting theoretical implications. This finding indicates that prospective adopters with higher education levels may be more likely to have negative attitudes toward the use of Internet pharmacy service. Previous research in the home-shopping literature suggests that in-home shoppers tend to possess more formal education than store shoppers.[213,214,215,216] The results of this research indicate that there may be aspects of Internet pharmacy service shopping that differentiate it from other in-home shopping experiences. Perhaps consumers who possess more formal education prefer to seek out experiences that allow them to expand their knowledge through peer-to-peer discussions and active dialogue. In this case, the more highly educated consumers may crave the intellectual stimulation offered by face-to-face interactions with health care providers. This educational environment allows questions regarding certain aspects of drug

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[212] Ostlund LE. Perceived innovation attributes as predictors of innovativeness. *Journal of Consumer Research*. 1974;1:23-29.

[213] Gillet PL. A profile of urban in-home shoppers. *Journal of Marketing.* 1970;34:40-45.

[214] Lumpkin JR, Hawes JM. Retailing without stores: An examination of catalog shoppers. *Journal of Business Research*. 1985;13:139-151.

[215] Jasper CR, Lan P-NR. Apparel catalog patronage: Demographic, lifestyle and motivational factors. *Psychology & Marketing*. 1992;9:275-96.

[216] Webber K, Roehl WS. Profiling people searching for and purchasing travel products on the World Wide Web. *Journal of Travel Research*. 1999;37(3):291-298.

therapy to be answered and discussed in a collegial manner. Before any generalizations regarding the effect of formal education upon attitude toward the use of Internet pharmacy service are made, it is important to mention how sample characteristics may have biased the analysis of this variable.

The sample used in this study included faculty and staff of The University of Texas at Austin. An analysis of formal education level indicates that there was inadequate sampling of individuals belonging to groups with less formal education. From the standpoint of generalization of study results, it is important to recognize how the demographic characteristics of the study sample relate to the demographic characteristics of the entire U.S. population of Internet users (Table 6.1).[217] An examination of education level indicates that the study respondents tend to be more highly educated than the general Internet using population, and an analysis of family income level suggests that study respondents report lower total family income than the general Internet using population.

[217] United States. U.S. Department of Commerce. *Home Computers and Internet Use in the United States*: August 2000. Washington: GPO, 2000.

Table 6.1. Sample Characteristics Compared to U.S. Population with Internet Access (2000 Census Data)

Education Level	2000 Census Data % of Total	Study Sample % of Total*
Less than HS	4.7	n/a
High School Diploma	22.2	3.0
Some College	31.3	8.4
Bachelors or More	41.9	90.1

Family Income 2000 Census Data**

	% of Total
Under $15,000	3.5
$15,000-19,999	2.2
$20,000-24,999	3.4
$25,000-34,999	9.9
$35,000-49,999	15.8
$50,000-74,999	25.9
$75,000+	39.3

Family Income Study Sample Data**

	% of Total
≤ $19,999	16.9
$20-29,999	14.4
$30-39,999	13.2
$40-54,999	11.1
$55-69,999	10.7
$70-84,999	9.5
≥ $85,000	24.3

* Less than high school diploma was not a valid response for study participants.

** Due to differences in scaling of family income variable, direct comparisons of income classifications could not be made across groups.

6.3 Perceived Relative Advantage

In this study, perceived compatibility was found to be the sole perceptual factor explaining perceived relative advantage of Internet pharmacy service. In contrast to what was hypothesized a priori, simplicity did not exert a significant direct influence upon perceived relative advantage. This finding is important in that it fails to confirm the previous findings of Hollak and Lehman. These researchers found that perceived relative advantage of innovative consumer durables was influenced by the perceived ease of use and the perceived compatibility of the product.[218]

This departure from the findings of Holak and Lehman may result from the high overall levels of perceived simplicity within the study sample. That is, if the entire group of potential adopters feels that an Internet pharmacy website would be easy to use—regardless of the perceived relative advantage—the simplicity variable ceases to become an important factor explaining relative advantage. An examination of the frequency distribution of this variable confirms this finding. In general, the study sample reported high levels of perceived simplicity (mean score 22.7 out of a possible 28). Therefore, the results indicate that compatibility is the primary factor explaining relative advantage.

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[218] Holak SL, Lehmann DR. Purchase intentions and the dimensions of innovation: An exploratory model. *Journal of Product Innovation Management*. 1990;7:59-73.

6.4 Perceived Risk

In this study, perceived simplicity and perceived compatibility exerted direct negative effects upon perceived risk of Internet pharmacy service, confirming the relationship with attitude posited by Hollak and Lehman's model of innovative consumer durables adoption.[219] However, contrary to what was originally hypothesized, perceived relative advantage did not exert a significant influence upon perceived risk of Internet pharmacy service. This finding suggests that, in the context of Internet pharmacy service, perceived relative advantage and perceived risk are not associated. That is, prospective Internet pharmacy adopters form their perceptions of risk independently of their existing perceptions of relative advantage.

6.5 Directions for Future Research

As is the case in most research endeavors, this study presents several issues that can be explored by future research. One important issue that can be addressed is the validity of the respecified research model through additional empirical research. As noted previously, the very nature of post-hoc model respecification departs from theory confirmation and is more appropriately described as an exploratory, theory building endeavor.[220] This is in large part because empirically-based respecifications

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[219] Ibid.

[220] Joreskog KG. Testing structural equation models. In Bollen KA, Long JS (Eds.), *Testing Structural Equation Models*. Newbury Park: Sage Publications, Inc., 1983: 294-316.

likely lead to capitalization on chance and overfitting (the addition of model parameters), resulting in models that may not validate across other samples. Ideally, if respecifications to a model are made, an empirical replication of the model should be undertaken to confirm the validity of newly added parameters. This is especially true in models tested in smaller samples (100-400).[221,222] In addition, if model changes are suggested on the basis of such tests, there is a need to seek out a theoretical rationale for them. This following section of the discussion will focus on the three proposed model respecificatons and explore possible underlying theoretical rationales. In each case, the burden will be passed to future researchers to help develop and understand more deeply the underlying theoretical processes at work.

6.5.1 Correlation Between Perceived Compatibility and Subjective Norm

The respecified model suggests that perceived compatibility of Internet pharmacy service and subjective norm towards Internet pharmacy adoption are correlated. This suggested model respecification carried with it the highest estimated chi-squared change, indicating that it contributed most toward improvement of fit.

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[221] MacCallum RC, Roznowski M, Necowitz LB. Model modifications in covariance structure analysis: The problem of capitalization on chance. *Psychological Bulletin*. 1992;111:490-504.

[222] Hoyle RH, Panter AT. Writing About Structural Equation Models. In Hoyle RH (Ed.). *Structural Equation Modeling: Concepts Issues and Applications*. Thousand Oaks: Sage Publications, Inc., 1998: 158-176.

This perceived compatibility-subjective norm correlation could be based on the idea that the influence of subjective norm referents is mediated by beliefs of compatibility. That is, a subjective norm referent's perception of compatibility may affect the level of influence exerted upon a prospective adopter.

6.5.2 Direct Effect of Perceived Compatibility Upon Behavioral Intent

The respecified model suggests that perceived compatibility exerts a direct positive effect upon behavioral intent to adopt Internet pharmacy service. The notion that a perception can exert a direct effect on behavioral intent is not entirely foreign. In fact, several pre-existing intention models exhibit similar direct effects.[223,224] Underlying this direct link is the notion that perceived compatibility of Internet pharmacy service exerts an effect upon intent that is over and above the effect of attitude towards Internet pharmacy service. Therefore, individuals looking to market this service innovation should not overlook the importance of perceived compatibility. This research suggests that intent to use this service can be influenced by promotional messages that can alter a consumer's perceptions of compatibility. The resulting effect upon intent to use operates over and above any pre-existing

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[223] Davis FD, Bagozzi RP. A field investigation of casual relations among cognitions, affect, intentions and behavior. *Journal of Marketing Research*. 1982;19:562-584.

[224] Brinberg DH. An examinationi of the determinants of intention and behavior: A comparison of two models. *Journal of Applied Social Psychology*. 1979;9:560-575.

positive or negative feelings a consumer may have toward the use of Internet pharmacy service.

6.5.3 Direct Effect of Total Family Income Upon Perceived Risk

The respecified model suggests that total family income exerts a direct negative influence upon risk. It suggests that prospective adopters with higher total family income levels perceive lower risk in using Internet pharmacy service when compared to prospective adopters with lower total family income levels. One underlying theoretical mechanism explaining this finding could lie in the fact that risk implies a possibility of loss. If one adopts this viewpoint, individuals with higher family incomes have a greater ability to sustain loss compared to lower income families. Another possible explanation is that risk-averse individuals tend to earn less money and therefore end up in lower income groups. That is, individuals in higher income groups are more likely to view the adoption of new technologies as a proposition that is associated with less risk.

6.6 Other Issues

In addition to the points raised through model respecification, future research can replicate this model in a different sample of respondents. In particular, an effort should be made to replicate this study in samples with demographic profiles that more closely correspond to those of the general population of Internet users. Also, future

researchers can contribute substantially to our understanding of Internet pharmacy adoption by investigating the importance of additional predictor variables.

6.7 Limitations

It is important to point out that there are several limitations to this research. Perhaps the most significant limitation results from the sample frame utilized. In general, study participants reported high levels of formal education. This is reflective of the sampling frame, which included graduate student teaching and research assistants and faculty members of the University of Texas. This unique sample characteristic suggests caution when generalizing these results to other, less well-educated, populations.

As with most survey research, the study results may suffer from significant non-response bias. Despite the use of follow up mailing to improve survey response, this study only achieved a response rate of 14.3 percent. More critical than the response rate are the ways in which responders and nonresponders differed. Since survey responses were devoid of unique identifiers, non-responders could not be identified for further study. A failure to consider how data from nonresponders may differ from responders could lead to problems in the interpretation and application of study results. The most significant potential problem includes the overgeneralization of results.

Additionally, it should be noted that this study was cross-sectional in nature and therefore represents the relationships between variables at a single point in time. At future points in time, consumer perceptions of Internet pharmacy service may change. These changes can be the result of advances in Internet technologies or further innovation in the Internet pharmacy service industry. Any event that can affect perceptions, attitudes or social norms as they relate to web-technologies or pharmacy service modes can alter the relationship between variables within the model, warranting a reevaluation of model structure or model parameters.

Finally, it is important to note some of the limitations inherent within the path analytic method itself. One of these is directionality. Directionality is a critical issue in the specification of path models. The proposed direct and indirect effects suggested in this model are statements regarding the expected sequence of the predictive relationships of variables within the model. The directionality of these relationships is grounded in previously published theoretical and empirical works. However, because this research was not longitudinal, the "causal" relationships between variables within this model cannot be discerned for certain. Therefore, when interpreting the results of this analysis, one should bear in mind that this study does nothing more but demonstrate one—but not the only—viable model that may explain intent to use Internet pharmacy service. The search for alternative models is a task left to be answered through continued empirical research on this topic. Another limitation that is inherent in the path analytic method is that of measurement error.

Path analysis assumes that all model variables are measured without error. As is the case with most research in the social sciences, the measurement of theoretical constructs with self report scales can introduce some degree of measurement error.

6.8 Conclusion

When developing Internet health service applications, designers and healthcare decision makers would like to predict how successful these services will be in terms of the rate and extent of consumer adoption. The importance of widespread acceptance of these systems is underscored by the large investment of time and resources required to bring these services to market. The present research addresses some of these issues.

One of the practical implications of this research lies in the marketing implications of these findings. The present study results indicate that while attitude and subjective norm are important factors in predicting intent to adopt, the importance of compatibility cannot be overlooked. Therefore, educational initiatives and promotional campaigns should focus on the similarities between shopping for drugs online and more traditional (brick-and-mortar) prescription shopping experiences. Also, another strategy may involve demonstrating the similarities between online prescription drug purchasing and other online purchasing experiences.

In the broader sense, this research is among the first to demonstrate the utility of an adoption of innovation model to explain the intent to use a web-enabled health

service application. In the future, health systems will continue to look to the Internet as a way to interface with and provide care to patients. In the interest of maximizing the utility of these services, adoption models similar to the one examined in this study will prove instrumental in both the design and marketing of these services.

APPENDIX 1
VIPPS Requirements

Qualifying VIPPS Pharmacies will:

1. Provide NABP with the information necessary to verify that the VIPPS pharmacy is licensed or registered in good standing to operate a pharmacy and/or engage in the practice of pharmacy with all applicable jurisdictions;

2. Provide NABP with the information necessary to verify that all persons affiliated with the site, including those affiliated through contractual or other responsible arrangements, that are engaging in the practice of pharmacy are appropriately licensed or registered and in good standing in all applicable jurisdictions; and

3. Agree to comply with all applicable statutes and regulations governing the practice of pharmacy where licensed or registered. When a conflict arises between individual state laws or regulations, or between state and federal laws or regulations, the VIPPS Pharmacy will agree to comply with the more stringent law or regulation that applies as determined by conflict-of-law rules.

Prescriptions

VIPPS Pharmacies, in accordance with applicable state and federal laws and regulations, will:

4. Maintain and enforce policies and procedures that assure the integrity, legitimacy, and authenticity of the Prescription Drug Order and seek to prevent Prescription Drug Orders from being submitted, honored, and filled by multiple pharmacies; and

5. Maintain and enforce policies and procedures that assure compliance with applicable generic substitution statutes and regulations and prohibit unauthorized therapeutic substitution from occurring without the necessary patient or prescriber authorization and outside of the conditions for participation in state or federal programs, such as Medicaid.

Patient Information

VIPPS Pharmacies, in accordance with applicable state and federal laws and regulations, will:

6. Maintain and enforce policies and procedures ensuring reasonable verification of the identity of the patient, prescriber, and, if appropriate, caregiver, in accordance with applicable state law;

7. Obtain and maintain in a readily accessible format, patient medication profiles and other related data in a manner that facilitates consultation with the prescriber, when applicable, and counseling of the patient or caregiver;

8. Conduct a prospective drug use review (DUR) prior to the dispensing of a medication or device in accordance with applicable state law; and

9. Maintain and enforce policies and procedures to assure patient confidentiality and protect patient identity and patient-specific information from inappropriate or non-essential access, use, or distribution. (The NABP Guidelines for the Confidentiality of Patient Health Care Information as It Relates to Patient Compliance and Patient Intervention Programs can serve as a useful resource for addressing the confidentiality and security of patient data.)

Communication

VIPPS Pharmacies, in accordance with applicable state and federal laws and regulations and VIPPS program criteria will:

10. Maintain and enforce policies and procedures requiring pharmacists to offer interactive, meaningful consultation to the patient or caregiver;

11. Maintain and enforce policies and procedures establishing a mechanism for patients to report, and the VIPPS Pharmacy to take appropriate action regarding, suspected adverse drug reactions and errors;

12. Maintain and enforce policies and procedures that provide a mechanism to contact the patient and, if necessary, the prescriber, if an undue delay is encountered in delivering the prescribed drug or device. Undue delay is defined as an extension of the normal delivery cycle sufficient to jeopardize or alter the patient treatment plan; and

13. Maintain and enforce policies and procedures establishing mechanisms to inform patients or caregivers about drug recalls and to educate patients and caregivers about the appropriate means to dispose of expired, damaged, and unusable medications.

Storage and Shipment

VIPPS Pharmacies, in accordance with applicable state and federal laws and regulations and VIPPS program criteria, will:

14. Ship controlled substances to patients via a secure and traceable means; and

15. Assure that medications and devices are maintained within appropriate temperature, light, and humidity standards, as established by the United States Pharmacopeia (USP), during storage and shipment.

Over-the-Counter Products

VIPPS Pharmacies will:

16. Comply with all applicable federal and state laws regarding the sale of Over-the-Counter Products identified as precursors to the manufacture or compounding of illegal drugs.

Quality Improvement Programs

VIPPS Pharmacies will:

17. Maintain a Quality Assurance/Quality Improvement Program.

Reporting to NABP

VIPPS Pharmacies will:

18. Notify NABP within 30 days of any change of information provided as part of the verification process or involving data displayed on the VIPPS Web site;

19. Notify NABP of any change of the Pharmacist-in-Charge;

20. Provide and maintain a link from the VIPPS Seal on the pharmacy's Web site to the VIPPS Web site in a form and manner acceptable to NABP.

Reporting by NABP

VIPPS Pharmacies will receive from NABP:

21. A listing on the VIPPS Web site, provided the listing is not deemed an endorsement of the listed pharmacy by NABP for the quality of care provided,

and is not utilized by the VIPPS Pharmacy in advertisements inferring such an endorsement; and

22. A licensing agreement permitting the VIPPS site to display the VIPPS Seal on its Web site, provided the advertisement or promotion does not imply an endorsement by NABP of the VIPPS Pharmacy, its services, or its products.

APPENDIX 2
Model Equations

To conduct this research, a structural equation modeling program (EQS) was used to estimate model fit and test research hypotheses. Using the path diagram depicted in Figure A1, variance/covariance decomposition was used to derive the equations that the model-fitting program utilized to populate the model implied variance/covariance matrix. The sample and model implied variance/covariance matrices were then used by the EQS program to derive values of the model parameters. This is accomplished by using the maximum likelihood method to minimize the value of the fitting function, maximizing model fit. These equations are found in Table A1 and Table A2.

Figure A1. Proposed Model Path Diagram

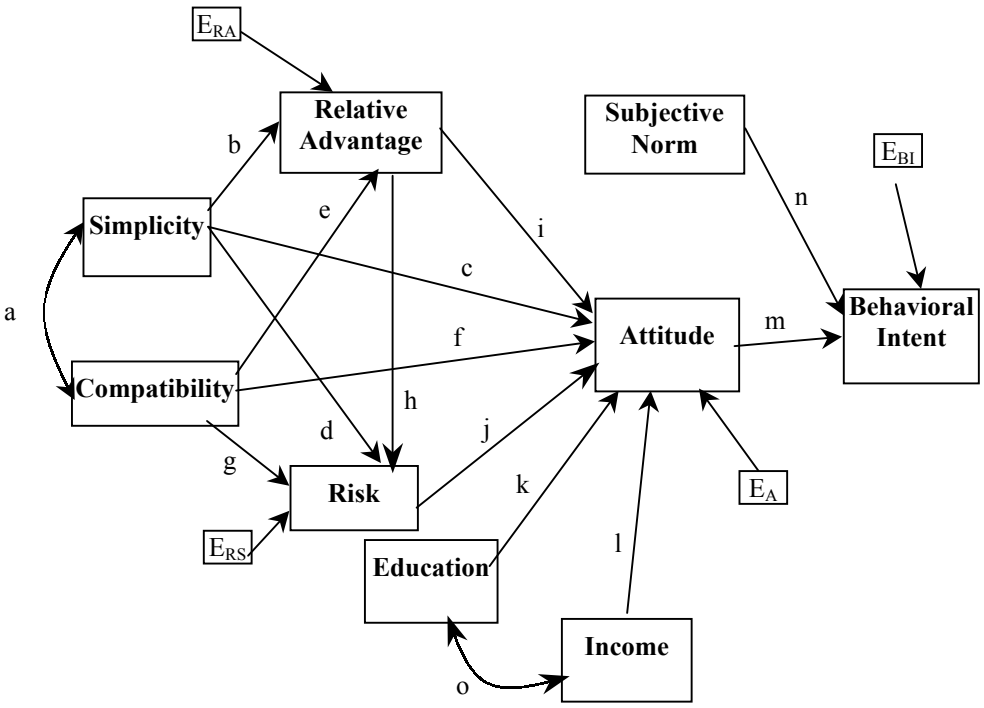


Table A1. Imposed Variance Covariance Matrix Equations for Proposed Research Model

Variances

$$\sigma_S^2 = \sigma_S^2$$

$$\sigma_C^2 = \sigma_C^2$$

$$\sigma_{RA}^2 = b^2\,\sigma_S^2 + 2be\sigma_{SC} + e^2\sigma_C^2 + \sigma_{\varepsilon ra}^2$$

$$\sigma_{RS}^2 = g^2\,\sigma_C^2 + d^2\,\sigma_S^2 + h^2\,\sigma_{RA}^2 + 2gd\sigma_{SC} + 2dbh\sigma_S^2 + 2hed\sigma_{SC} 2geh\sigma_C^2 + 2gbh\sigma_{SC} + \sigma_{\varepsilon rs}^2$$

$$\sigma_A^2 = 2kl\sigma_{EDTFI} + i^2\sigma_{RA}^2 + c^2\sigma_S^2 + f^2\sigma_C^2 + j^2\sigma_{RS}^2 + 2ibc\sigma_S^2 + 2ibf\sigma_{SC} + 2ibdj\sigma_S^2 + 2ibgj\sigma_{SC} + 2cdj\sigma_S^2 + 2cf\sigma_{SC} + 2cgj\sigma_{SC} + 2cei\sigma_{SC} + 2cehj\sigma_{SC} + 2fei\sigma_C^2 + 2fehj\sigma_C^2 + 2iegj\sigma_C^2 + 2fgj\sigma_C^2 + 2fdj\sigma_{SC} + 2fbhj\sigma_{SC} + k^2\sigma_{ED}^2 + l^2\sigma_{TFI}^2 + \sigma_{\varepsilon a}^2$$

$$\sigma_{ED}^2 = \sigma_{ED}^2$$

$$\sigma_{TFI}^2 = \sigma_{TFI}^2$$

$$\sigma_{SN}^2 = \sigma_{SN}^2$$

$$\sigma_{BI}^2 = m^2\sigma_A^2 + n^2\sigma_{SN}^2 + \sigma_{\varepsilon bi}^2$$

Covariances

$$\sigma_{SC} = \sigma_{SC}$$

$$\sigma_{EDTFI} = \sigma_{EDTFI}$$

Total Effects

$$\sigma_{RAS} = b\sigma_S^2 + e\sigma_{SC}$$

$$\sigma_{RAC} = e\sigma_C^2 + b\sigma_{SC}$$

$$\sigma_{AS} = c\sigma_S^2 + dj\sigma_S^2 + bi\sigma_S^2 + bhj\sigma_S^2 + f\sigma_{SC} + ei\sigma_{SC} + ehj\sigma_{SC} + gj\sigma_{SC}$$

$$\sigma_{AC} = f\sigma_C^2 + ei\sigma_C^2 + gj\sigma_C^2 + ehj\sigma_C^2 + bi\sigma_{SC} + c\sigma_{SC} + bhj\sigma_{SC} + dj\sigma_{SC}$$

$$\sigma_{ARS} = j\sigma_{RS}^2 + hi\sigma_{RA}^2 + hbc\sigma_S^2 + hbf\sigma_{SC} + dc\sigma_S^2 + dbi\sigma_S^2 + dei\sigma_{SC} + df\sigma_{SC} + gf\sigma_C^2 + gc\sigma_{SC} + gbi\sigma_{SC} + hef\sigma_C^2 + gei\sigma_C^2$$

$$\sigma_{RSS} = d\sigma_S^2 + bh\sigma_S^2 + g\sigma_{SC} + eh\sigma_{SC}$$

$$\sigma_{RSC} = g\sigma_C^2 + eh\sigma_C^2 + d\sigma_{SC} + bh\sigma_{SC}$$

$$\sigma_{RSRA} = h\sigma_{RA}^2 + bd\sigma_S^2 + eg\sigma_C^2 + bg\sigma_{SC}$$

$$\sigma_{ARA} = i\sigma_{RA}^2 + hj\sigma_{RA}^2 + bc\sigma_S^2 + bdj\sigma_S^2 + bf\sigma_{SC} + bgj\sigma_{SC}$$

$$\sigma_{AED} = k\sigma_{ED}^2 + l\sigma_{EDTFI}$$

$$\sigma_{ATFI} = l\sigma_{TFI}^2 + k\sigma_{EDTFI}$$

$$\sigma_{BIA} = m\sigma_A^2$$

$$\sigma_{BISN} = n\sigma_{SN}^2$$

Table A2. EQS Program Structural Equation Models Used to Develop EQS Input Program

---

$RA = S + C + \varepsilon_{RA}$
$RS = S + C + RA + \varepsilon_{RS}$
$A = S + C + RA + RS + ED + TFI + \varepsilon_{A}$
$BI = A + SN + \varepsilon_{BI}$

APPENDIX 3
Scale Items

Compatibility Scale

Using an Internet pharmacy website to have my prescriptions filled would be compatible with all aspects of the way that I like to purchase prescription medications.

:	:	:	:	:	:	:
Strongly Disagree			Neutral			Strongly Agree

I think that using an Internet pharmacy website would fit well with the way in which I like to purchase prescription medications.

:	:	:	:	:	:	:
Strongly Disagree			Neutral			Strongly Agree

Using an Internet pharmacy website to have prescriptions filled would fit into my prescription medication purchasing style.

:	:	:	:	:	:	:
Strongly Disagree			Neutral			Strongly Agree

Simplicity Scale

Learning to use an Internet pharmacy website to have my prescriptions filled would be easy for me.

	:		:		:		:		:		:	
Strongly Disagree					Neutral							Strongly Agree

I would find it easy to get an Internet pharmacy website to do what I want it to do.

	:		:		:		:		:		:	
Strongly Disagree					Neutral							Strongly Agree

It would be easy for me to become skillful at using an Internet pharmacy website.

	:		:		:		:		:		:	
Strongly Disagree					Neutral							Strongly Agree

I would find an Internet pharmacy website easy to use.

	:		:		:		:		:		:	
Strongly Disagree					Neutral							Strongly Agree

Relative Advantage Scale

Please indicate the likelihood that the use of an Internet pharmacy website for prescription filling is associated with the following benefits:

Timesavings:

likely_____ : _____ : _____ : _____ : _____ : _____ : _____unlikely

extremely quite slightly neither slightly quite extremely

Effort savings:

likely_____ : _____ : _____ : _____ : _____ : _____ : _____unlikely

extremely quite slightly neither slightly quite extremely

Monetary value:

likely_____ : _____ : _____ : _____ : _____ : _____ : _____unlikely

extremely quite slightly neither slightly quite extremely

Perceived Risk Scale

Please indicate the likelihood that the use of an Internet pharmacy website for prescription filling is associated with the following risks:

Paying more for my prescriptions.

likely_____ : _____ : _____ : _____ : _____ : _____ : _____ unlikely

extremely quite slightly neither slightly quite extremely

Dealing with fraudulent credit card charges.

likely_____ : _____ : _____ : _____ : _____ : _____ : _____ unlikely

extremely quite slightly neither slightly quite extremely

Spending a great deal of time filling out online order forms.

likely_____ : _____ : _____ : _____ : _____ : _____ : _____ unlikely

extremely quite slightly neither slightly quite extremely

Not knowing the pharmacist who fills my prescription.

likely_____ : _____ : _____ : _____ : _____ : _____ : _____ unlikely

extremely quite slightly neither slightly quite extremely

Having no one to ask questions about my medication.

likely_____ : _____ : _____ : _____ : _____ : _____ : _____ unlikely

extremely quite slightly neither slightly quite extremely

Worry about running out of medicine before my order comes.

likely_____ : _____ : _____ : _____ : _____ : _____ : _____ unlikely

extremely quite slightly neither slightly quite extremely

Worry about getting the wrong medicine.

likely_____ : _____ : _____ : _____ : _____ : _____ : _____ unlikely

extremely quite slightly neither slightly quite extremely

Worry about unauthorized persons gaining access to private information about my health.

likely_____ : _____ : _____ : _____ : _____ : _____ : _____ unlikely

extremely quite slightly neither slightly quite extremely

Actually running out of my medicine before my order comes.

likely_____ : _____ : _____ : _____ : _____ : _____ : _____ unlikely

extremely quite slightly neither slightly quite extremely

Attitude Scale

My using an Internet pharmacy website to have a prescription filled within the next year is:

wise	:	:	:	:	:	:	foolish
	extremely	quite	slightly	neither	slightly	quite	extremely
good	:	:	:	:	:	:	bad
	extremely	quite	slightly	neither	slightly	quite	extremely
rewarding	:	:	:	:	:	:	punishing
	extremely	quite	slightly	neither	slightly	quite	extremely
unpleasant	:	:	:	:	:	:	pleasant
	extremely	quite	slightly	neither	slightly	quite	extremely

Subjective Norm Scale

People who influence my behavior think that

I should_____ : _____ : _____ : _____ : _____ : _____ : _____ I should not use an Internet pharmacy website to have my prescriptions filled within the next year.

Generally speaking, how much do you want to do what people who influence your behavior think you should do?

Not at all_____ : _____ : _____ : _____ : _____ : _____ : _____ Very much

People who are important to me think that

I should_____ : _____ : _____ : _____ : _____ : _____ : _____ I should not use an Internet pharmacy website to have my prescriptions filled within the next year.

Generally speaking, how much do you want to do what people who are important to you think you should do?

Not at all_____ : _____ : _____ : _____ : _____ : _____ : _____ Very much

Behavioral Intent Scale

I intend to use an Internet pharmacy website to have a prescription filled within the next year.

likely							unlikely
extremely	quite	slightly	neither	slightly	quite	extremely	

APPENDIX 4

This survey will ask about your perceptions and attitudes towards Internet pharmacy service. In addition, this questionnaire will include some questions about your satisfaction with your prescription insurance.

It is important that this questionnaire is filled out by a member of your family that makes decisions about what pharmacy to use to have prescriptions filled. Also, this survey should be filled out by someone who is at least 18 years of age.

Section 1

This first section of the questionnaire asks about your patterns of computer and Internet use. Please select the button that corresponds to your answer.

Q1. From where do you primarily access the Internet?

- ○ Home
- ○ Work
- ○ Other

Q2. Have you ever purchased prescription medications over the Internet?

- ○ Yes
- ○ No

Section 2a

In this section of the questionnaire we would like to learn about your general attitude towards Internet pharmacy service. Listed below are some general questions on your attitude towards using Internet pharmacy service, and your level of intent to use Internet pharmacy service. Please select the button that corresponds to your answer.

The first four questions in this section focus on your attitude towards using an Internet pharmacy service provider. Following these instruction you will find a statement that describes a very specific behavior. Please rate your feelings about this behavior using the four sets of adjective scales below the statement.

Use of an Internet pharmacy website to have a prescription filled within the next year by me would be:

Q3	wise	O	O	O	O	O	O	O	foolish
		extremely	quite	slightly	neither	slightly	quite	extremely	
Q4	good	O	O	O	O	O	O	O	bad
		extremely	quite	slightly	neither	slightly	quite	extremely	
Q5	beneficial	O	O	O	O	O	O	O	harmful
		extremely	quite	slightly	neither	slightly	quite	extremely	
Q6	pleasant	O	O	O	O	O	O	O	unpleasant
		extremely	quite	slightly	neither	slightly	quite	extremely	

Section 2b

In some situations, a person may do something because they are influenced by what someone else (i.e., a spouse,a supervisor or a trusted friend) thinks they should do. Next, we would like to learn about how people who are important to you influence your intent to use an Internet pharmacy service provider. Please select the button that corresponds to your answer.

Q7. People who influence my behavior think that

I should: O O O O O O O I should not

neither

use an Internet pharmacy website to have a prescription filled in the next year

Q8. Generally speaking, how much do you want to do what people who influence your behavior think you should do?

Not at all: O O O O O O O :Very much

neither

Q9. People who are important to me think that

I should: O O O O O O O I should not

neither

use an Internet pharmacy website to have a prescription filled in the next year

Q10. Generally speaking, how much do you want to do what people who are important to you think you should do?

Not at all: O O O O O O O :Very much

neither

Section 2c

Q11. How likely is it that you will intend to use an Internet pharmacy website to have a prescription filled within the next year.

Likely O O O O O O O Unlikely

extremely quite slightly neither slightly quite extremely

Section 3a

In the next section of the questionnaire, we would like to learn more about your views on the advantages and risks of Internet pharmacy service when compared to traditional brick-and-mortar pharmacy service. Brick-and-mortar pharmacy service is a term we will use to describe traditional methods of pharmacy service, such as retail, chain, or independent pharmacy service. (e.g., Walgreen's, Eckerd's, HEB, or the Medicine Shop).

For the following questions, in comparison to brick-and-mortar pharmacy service, please indicate the likelihood that the use of an Internet pharmacy website for prescription filling is associated with the following benefits. Please select the button that corresponds to your answer.

Q12. Saves time

Likely							Unlikely
extremely	quite	slightly	neither	slightly	quite	extremely	

Q13. Saves effort

Likely							Unlikely
extremely	quite	slightly	neither	slightly	quite	extremely	

Q14. Saves money

Likely							Unlikely
extremely	quite	slightly	neither	slightly	quite	extremely	

Section 3b

How likely do you believe the use of an Internet pharmacy website for prescription filling is associated with the following risks. Please select the button that corresponds to your answer.

Q15. Paying more for my prescriptions.

Likely							Unlikely
extremely	quite	slightly	neither	slightly	quite	extremely	

Q16. Paying more in fraudulent credit card charges.

Likely							Unlikely
extremely	quite	slightly	neither	slightly	quite	extremely	

Section 3b (cont'd)

Q17. Spending a great deal of time filling out online order forms.

Likely							Unlikely
extremely	quite	slightly	neither	slightly	quite	extremely	

Q18. Not knowing the pharmacist who fills my prescription.

Likely							Unlikely
extremely	quite	slightly	neither	slightly	quite	extremely	

Q19. Having no one to ask questions about my medication.

Likely							Unlikely
extremely	quite	slightly	neither	slightly	quite	extremely	

Q20. Worry about running out of medicine before my order arrives.

Likely							Unlikely
extremely	quite	slightly	neither	slightly	quite	extremely	

Q21. Worry about getting the wrong medicine.

Likely							Unlikely
extremely	quite	slightly	neither	slightly	quite	extremely	

Q22. Worry about unauthorized persons gaining access to private information about my health.

Likely							Unlikely
extremely	quite	slightly	neither	slightly	quite	extremely	

Q23. Actually running out of my medicine before my order arrives.

Likely							Unlikely
extremely	quite	slightly	neither	slightly	quite	extremely	

Section 4

Next, we would like to learn about your opinions on the compatibility and simplicity of using Internet pharmacy service. For the following questions, please indicate the level to which you agree with the statements listed. Please select the button that corresponds to your answer.

Q24. Learning to use an Internet pharmacy website to have my prescriptions filled would be easy for me.

Strongly agree							Strongly disagree
			neither				

Q25. I would find it easy to get an Internet pharmacy website to do what I want it to do.

Strongly agree							Strongly disagree
			neither				

Q26. It would be easy for me to become skillful at using an Internet pharmacy website.

Strongly agree							Strongly disagree
			neither				

Q27. I would find an Internet pharmacy website easy to use.

Strongly agree							Strongly disagree
			neither				

Q28. Using an Internet pharmacy website to have my prescriptions filled would be compatible with all aspects of the way that I like to purchase prescription medications.

Strongly agree							Strongly disagree
			neither				

Section 4 (cont'd)

Q29. I think that using an Internet pharmacy website would fit well with the way in which I like to purchase prescription medications.

Strongly agree							Strongly disagree
			neither				

Q30. Using an Internet pharmacy website to have prescriptions filled would fit into my prescription medication purchasing style.

Strongly agree							Strongly disagree
			neither				

Section 5

Next, we would like to ask some questions about you and your level of satisfaction with your prescription insurance provider. Please select the button that corresponds to your answer.

Q31. Do you have medical insurance through the University of Texas?

- ○ Yes
- ○ No

Q32. Which medical insurance plan are you enrolled in?

- ○ Humana
- ○ UTSelect

Q33. Have you ever called your prescription insurance company?

- ○ Yes
- ○ No

If you answered no to Q33 (above), please skip Q34 and go to Q35. If you answered yes to Q33 (above), please answer Q34.

Q34. How would you rate your level of satisfaction with the customer service you have received when calling your prescription insurance company.

Unsatisfied							Satisfied
	○	○	○	○	○	○	○
	extremely	quite	slightly	neither	slightly	quite	extremely

Q35. Have you ever ordered prescriptions via the mail service pharmacy program?

- ○ Yes
- ○ No

If you answered no to Q35 (above) please skip Q36 and go to Q37. If you answered yes to Q35 (above), please answer Q36.

Section 5 (cont'd)

Q36. How would you rate your level of satisfaction with the customer service you have received when ordering prescriptions via the mail order service.

Unsatisfied							Satisfied
	extremely	quite	slightly	neither	slightly	quite	extremely

Q37. When you receive a prescription medication, are you aware of the full cost of the medication versus the portion that you pay through your co-payment?

- Yes
- No

Section 6

Now, we would like to learn a little bit about you so that we can better understand your responses.

Q38. In what year were you born?

19[ ]

Q39. What is your gender?

- ○ Male
- ○ Female

Q40. What is the highest level of education that you have achieved?

Select One

Q41. What is the total family income for your household before taxes?

Select One

Q42. Which of the following categories best describes your racial or ethnic identification?

- ○ Black
- ○ Chicano or Hispanic
- ○ Native American
- ○ White
- ○ Asian or Pacific Islander
- ○ Other, please specify

[ ]

APPENDIX 5
Survey Introduction E-mail

Dear Sir or Madam:

You have been randomly selected from a list of University of Texas employees to receive a questionnaire that is part of a dissertation research study that will examine consumer perceptions and attitudes towards Internet pharmacy service. We sincerely ask that you help us by taking 10 minutes of your time to complete this survey when it arrives in approximately 2 days.

As you may be aware, the University of Texas prescription health insurance plans allow you, as a beneficiary, to order prescription medications using an Internet Pharmacy website. To date, no research has focused on how people's perceptions and attitudes toward Internet pharmacy service relate to their intent to use this service.

This questionnaire is a part of a dissertation research project being conducted in the Division of Pharmacy Administration at the University of Texas at Austin. The results of the study will be used to help better understand what factors influence a person's intent to have prescriptions filled using an Internet pharmacy. Your participation in this study will be a great help to us.

We sincerely hope that you choose to participate in this important study. However, if you do not wish to participate, reply to the following E-mail address (connerpharmd@forum.utexas.edu) and include the words "NO SURVEY" in the subject line before Friday, March 1. By doing so you will be removed from our list of participants and you will not receive any future mailings. If you have any questions about this study, please do not hesitate to contact us by phone at (512) 471-6892.

Sincerely,

Christopher Conner, Pharm.D.	James P. Wilson, Ph.D.	Carolyn M. Brown, Ph.D.
Ph.D. Candidate	Associate Professor	Associate Professor
Division of Pharmacy Administration	Division of Pharmacy Practice	Division of Pharmacy Administration

APPENDIX 6
Survey Cover Letter

Dear Sir or Madam:

You have been randomly selected to participate in a dissertation research study entitled: The influence of personal characteristics, perceived innovation attributes, attitude, and subjective norm upon intent to adopt Internet pharmacy service: An adoption of innovations study. This study questionnaire measures your perceptions and attitudes about Internet pharmacy service and relates to dissertation research being conducted in the Division of Pharmacy Administration at the University of Texas at Austin. Your responses to the study questionnaire will be a great help to us in improving our understanding of what factors help explain the use of Internet pharmacy.

A portion of this survey was developed in partnership with the Office of Human Resources, Health Benefits Department. This information will provide the University with Important information on your level of satisfaction with the University's prescription drug insurance program.

This questionnaire has been sent to a random sample of 2,000 employees of the University of Texas at Austin. Participation in this study is voluntary, and if you choose not to participate, this will not affect your relationship with the University of Texas; however, we sincerely hope you will participate so that our results will be a good representation of the entire population of University of Texas employees. Also, since some of the data collected in this survey will be reported anonymously to the Office of Human Resources Health Insurance Department, it provides you with the opportunity to make your voice heard on issues that may help guide future decisions regarding our prescription drug insurance program.

This survey takes approximately ten minutes to complete. Your responses will be kept confidential. You do not have to answer every question in the survey. Your completing and returning the questionnaire will be taken as evidence of your willingness to participate and your consent to have the information used for purposes of the study. If you have any questions, please do not hesitate to contact us by phone at (512) 471-6892.

Thank you in advance for your time and cooperation in participating in this important study. Please save this Email for your own records.

Sincerely,

Christopher Conner, Pharm.D.	James P. Wilson, Ph.D.	Carolyn M. Brown, Ph.D.
Ph.D. Candidate	Associate Professor	Associate Professor
Division of Pharmacy Administration	Division of Pharmacy Practice	Division of Pharmacy Administration

Go to: http://uts.cc.utexas.edu/~oliverg/survey/
Please click on this link now or cut and past the web address text onto your web browser "Address" field.

APPENDIX 7
Follow up E-mail

Dear Sir or Madam:

About two weeks ago, you were contacted regarding a questionnaire asking about your perceptions and attitudes toward Internet pharmacy service. If you have already completed the questionnaire, please accept our sincere thanks.

If you have not yet completed the questionnaire, we kindly ask for your assistance by completing it as soon as possible. Your viewpoints and opinions are very important to us. A link to the survey questionnaire can be found below.

If you have any questions, please do not hesitate to contact us by phone at (512) 471-6892.

Thank you in advance for your time and cooperation in participating in this important study.

Sincerely,

Christopher Conner, Pharm.D.	James P. Wilson, Ph.D.	Carolyn M. Brown, Ph.D.
Ph.D. Candidate	Associate Professor	Associate Professor
Division of Pharmacy Administration	Division of Pharmacy Practice	Division of Pharmacy Administration

Go to: http://uts.cc.utexas.edu/~oliverg/survey/
Please click on this link now or cut and past the web address text onto your web browser "Address" field.

APPENDIX 8
Model Variables Frequency Distributions

Figure A1. Frequency Distribution of Behavioral Intent Variable

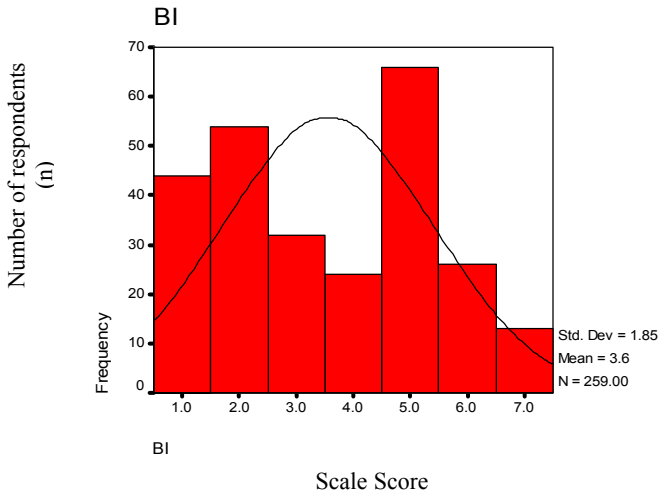


Figure A2. Frequency Distribution of Attitude Variable

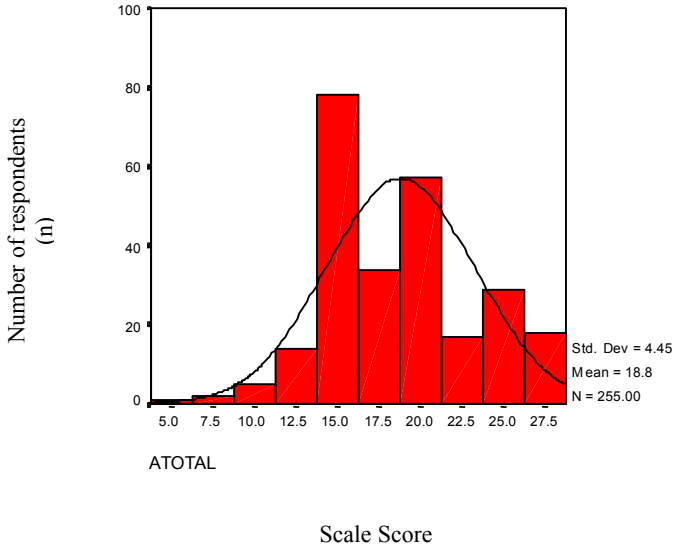


Figure A3. Frequency Distribution of Subjective Norm Variable

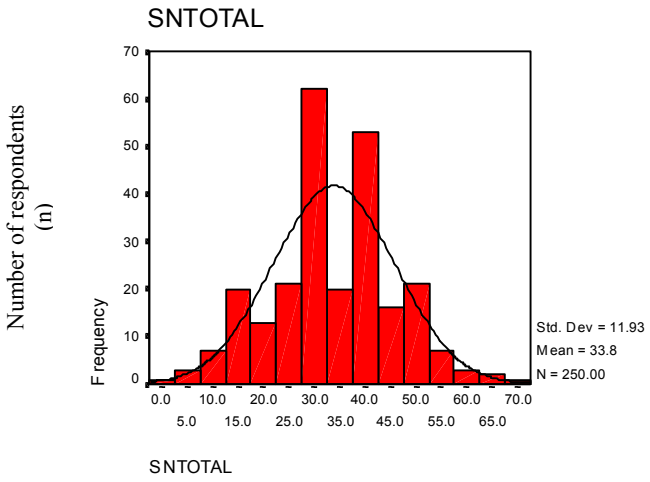


Figure A4. Frequency Distribution of Level of Education Variable

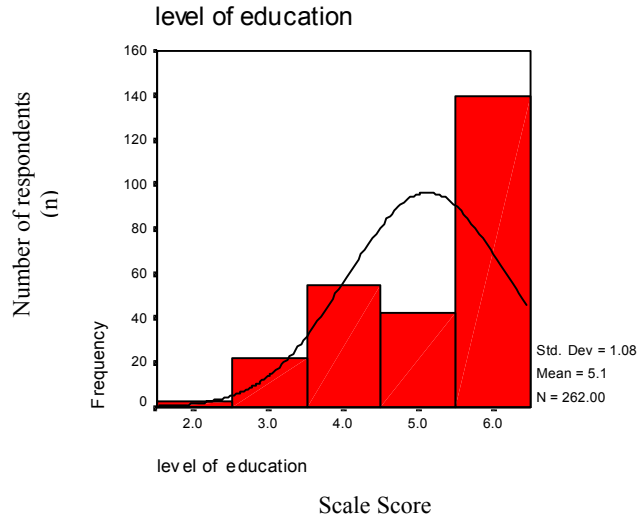


Figure A5. Frequency Distribution of Total Family Income Variable

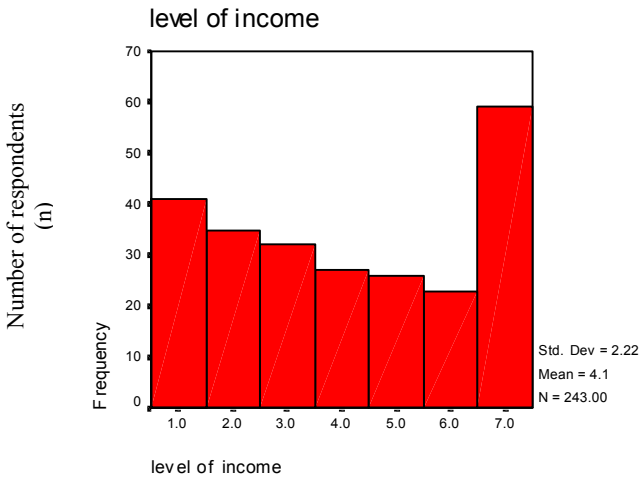


Figure A6. Frequency Distribution of Perceived Relative Advantage Variable

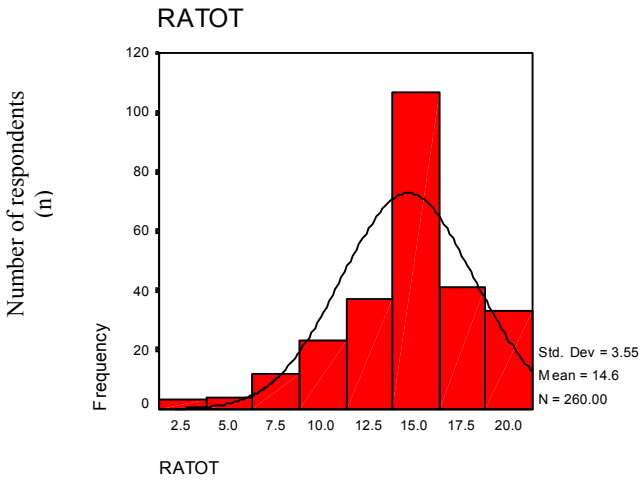


Figure A7. Frequency Distribution of Perceived Compatibility Variable

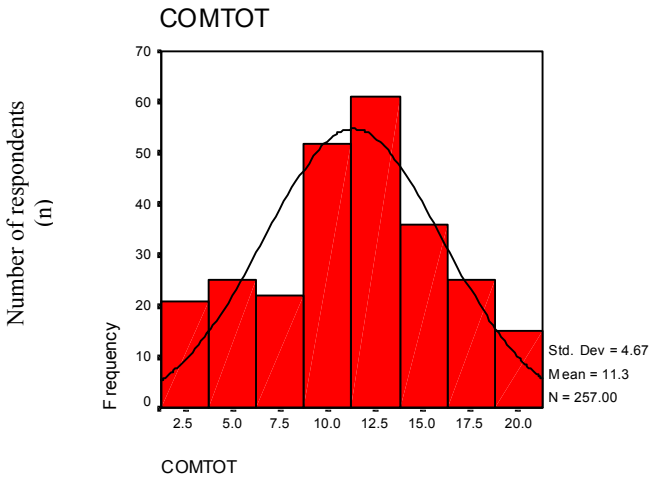


Figure A8. Frequency Distribution of Perceived Simplicity Variable

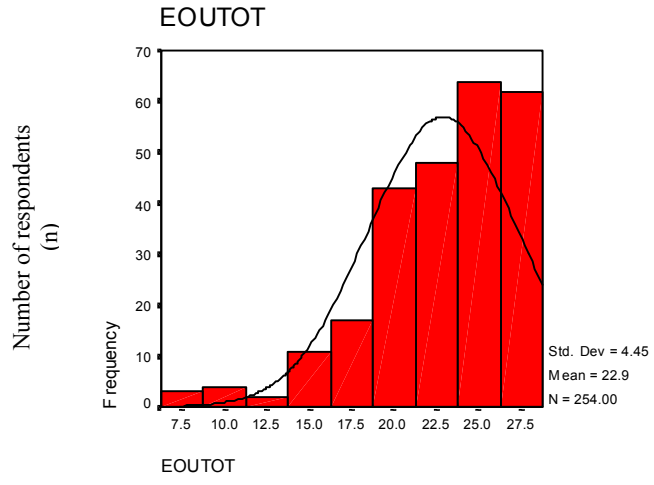
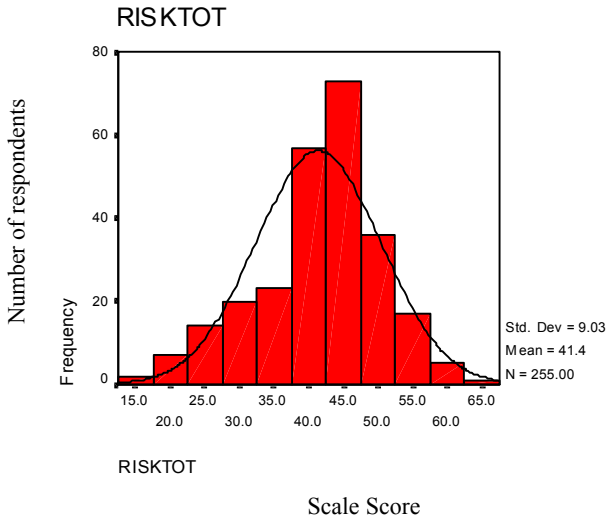


Figure A9. Frequency Distribution of Perceived Risk Variable



APPENDIX 9
Study Data Correlation Matrix

Table A9. Raw Study Data Correlation Matrix

	A	SN	BI	RA	RS	S	C	ED	TFI
A	1.00								
SN	.28	1.00							
BI	.62	.36	1.00						
RA	.63	.26	.50	1.00					
RS	-.34	-.06	-.19	-.19	1.00				
S	.33	.05	.23	.22	-.26	1.00			
C	.62	.26	.52	.59	-.36	.29	1.00		
ED	-.22	-.01	-.07	-.16	.07	-.05	-.14	1.00	
TFI	.06	.07	.10	.02	-.21	.08	.05	-.07	1.00

LEGEND

S = Simplicity
C = Compatibility
RA = Relative Advantage
RS = Risk
A = Attitude
SN = Subjective Norm
TFI = Total Family Income
ED = Formal Education
BI = Behavioral Intent

APPENDIX 10
Results of Parameter Estimation Proceedures for Model Variances

Table A10. Variances of Independent Variables of Proposed Research Model

Model Component	Variance	t-value*
S	19.89	10.885
C	21.715	13.172
SN	142.457	10.885
TFI	4.936	20.263
ED	1.168	13.140
E_{RA},	8.237	10.707
E_{RS}	66.738	10.577
E_A	10.173	9.277
E_{BI}	2.084	9.277

LEGEND

S = Simplicity	SN = Subjective Norm
C = Compatibility	TFI = Total Family Income
RA = Relative Advantage	ED = Formal Education
RS = Risk	BI = Behavioral Intent
A = Attitude	E = Error

* = all variances significant at $p < 0.001$

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